Model Engineer

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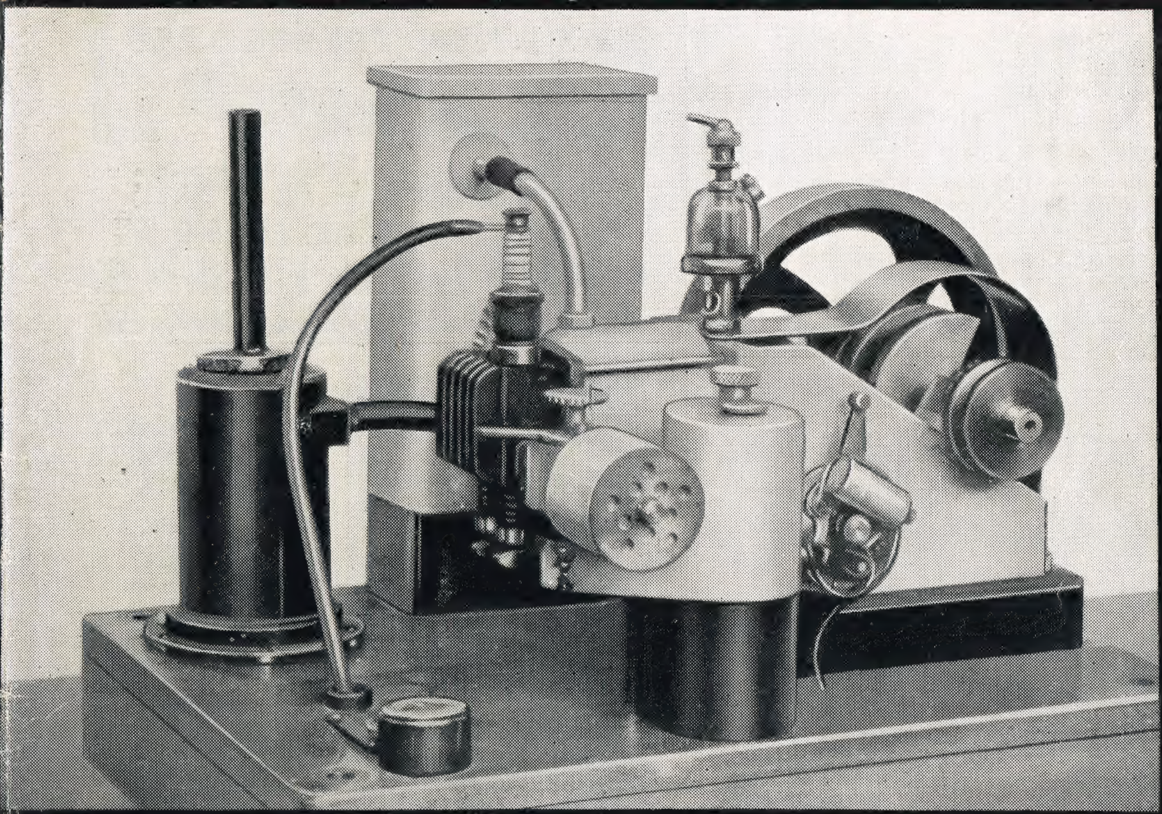

ONE SHILLING 21 NOVEMBER 1957 VOL 117 NO 2948

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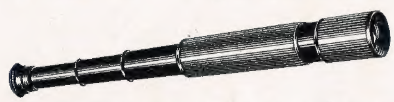

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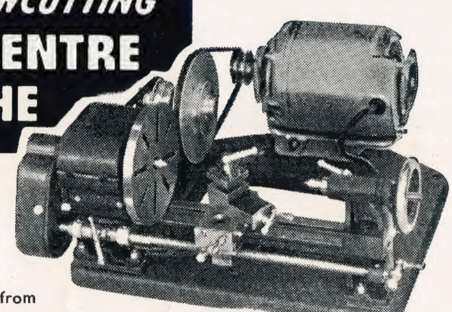

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Model Engineer

ONE SHILLING 21 NOVEMBER 1957 VOL. 117 NO 2948

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Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

IT will take us a little while to get used to the empty desk on the sixth floor at 19 Noel Street. When points of historical reference about the house of Percival Marshall crop up in future we must find another fountain source of information instead of taking the lift to the sixth and bearing down on Bill Evans' desk, for Bill has retired to his house and garden in Bushey, Herts, after 56 prodigious years with MODEL ENGINEER.

But there is to be no suburban autumn in the life of the one-time draughtsman, assistant editor and production manager. A man who once spent an entire week in the ME office, working 18 hours a day and snatching a few hours sleep on the office rug, to catch up with the emergency caused by the sudden death of a colleague, would find the humdrum round of a London dormitory area somewhat dull, so Bill has plans for his retirement.

In company with his wife, he is to visit Rhodesia; the eldest son, who is a pilot with Hunting-Clan Air Transport, will fly his parents there.

Worked with P.M.

After that Bill is to take his wife on a long-promised holiday to the Canary Isles; and included in his itinerary is a trip to Sweden at the invitation of some Swedish friends, who once stayed with the Evans family while on an educational trip to Britain.

Bill Evans can trace his commercial roots back to the founder of the firm, Percival Marshall, with whom he worked in close association for very many years.

He was only 13 when he joined MODEL ENGINEER as office boy. That was in 1901, the magazine was scarcely three years old and still

W. H. Evans

struggling to make headway in an age when popular technical journalism was almost unheard of. In fact, it can be said that ME, and papers like it, pioneered the modern mass-circulation technical periodicals.

ME was then edited at the offices of Horace Marshall and Co. in Temple House, Tallis Street, and Henry Greenly was the draughtsman and sub-editor, tasks which at various times were taken over by the versatile Bill himself.

Model Railway News was signalled

Smoke Rings . . .

in 1925 and it was the team of Percival Marshall and Bill Evans that ran this popular journal for 11 years until J. N. Maskelyne, who himself retired only recently, joined the staff in 1936.

Evans was essentially a staff man and almost unknown to the bulk of our readers, but he was always present at ME Exhibitions, the early ones of which he helped to organise.

There is an anecdote concerning one which will stand repeating. Mrs Evans had just presented Bill with an addition to the Evans household and Bill proudly carried the infant in his arms to the Exhibition of that year.

Percival Marshall, displaying a fine sense of opportunism, accompanied Bill round the stands pointing out to friends and visitors the "finest scale model in the show."

His work with the house of Percival Marshall is the only job Bill has had in his long life, and that long service was broken only by his time in the Army in the first world war when he was a member of the 8th Essex Cyclists' Regiment; it was in reply to an advertisement in *Cycling* calling on expert cyclists to volunteer for war service that Evans joined the Forces in 1914.

He was wounded and taken prisoner, and had a pretty uncomfortable time, but Bill does not talk much of this era in his life.

Same enthusiasm

A lot has happened to Percival Marshall and Co. Ltd since Bill first filled its inkpots. In those days contributors to MODEL ENGINEER, eager to see the new journal flourish, submitted their copy and drawings without payment, and Henry Greenly, Bill Evans and P.M. himself filled in the gaps.

Today there is a larger staff but the same keenness and sense of purpose permeate the building.

Evans has two mementoes with which to recall his lifetime's work: one is a wristwatch presented to him by Mr Kenneth Garcke, chairman of Percival Marshall and Co Ltd, at the Exhibition of 1951 in recognition of Evans' 50 years with the firm; the other is a travelling case given to him by his colleagues on his retirement.

I send best wishes to Bill Evans and his wife and hope that he will continue to roll that inevitable cigarette for many years to come.

Instructor needed

FOR someone with the necessary qualifications who would like a pleasant and varied job there is an excellent opportunity at Harrow School.

Eric Hudson-Davies, the master in charge of the workshops at Harrow College, telephoned me the other day with details of this attractive vacancy, which is for an instructor in the metalwork shop.

The applicant would be required to instruct small classes of up to eight boys to Ordinary Level for the General Certificate of Education and to teach elementary mechanical drawing to a class of about four boys.

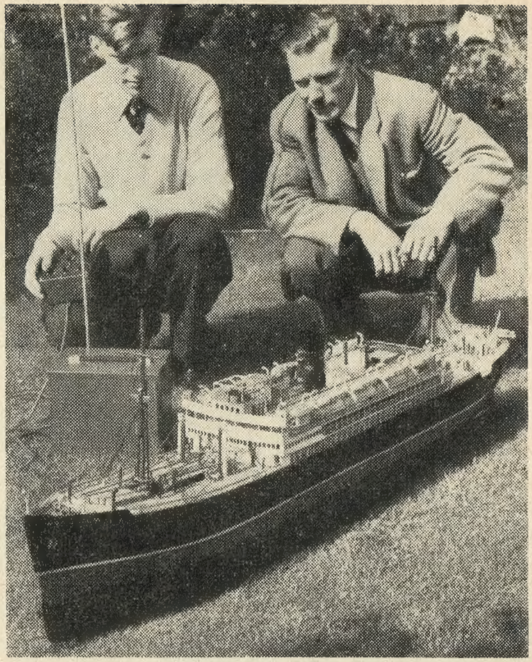
There is a good deal of hobbywork in the shop, which may include helping a boy to repair a cycle or lawnmower, or to build a model airplane engine or steam locomotive. In addition the tutor would be expected to interest himself in the Motor Driving Club; there would be no instruction or car cleaning to be done but he would be responsible for the day-to-day maintenance of the two almost new cars belonging to the club.

The post carries a salary of £9 to £10 a week and the free tenancy of a house near to the workshop. Mr Hudson-Davies tells me that there are seven weeks' holiday a year and the job carries some pension rights depending on age at entry.

Anyone who would like to discuss the situation with Mr Hudson-Davies should phone Byron 1748, or write to him c/o Harrow School Workshop, Church Hill, Harrow on the Hill.

Cover picture

Fabricated horizontal engine built by Mr Sinclair and exhibited on the Malden SME stand at this year's Model Engineer Exhibition



Councillor P. W. Scott, Mayor of Halesowen, Worcs, and his son Christopher (left) spent seven years on the construction of this radio-controlled model of the CIRCASSIA. *Electric motors power the 5 ft long craft*

Doncaster's last

NO 76114. That is the number of British Railways standard class 4 2-6-0 which will go down in the archives of history as the last steam engine to be built by the world-famous works at Doncaster which has created among other superb pieces of locomotive engineering the immortal *Mallard*, holder of the world speed record for steam.

From now on, apart from repairing steam engines under its domain, the Doncaster works will be devoted to the production of diesel shunters, electric locomotives for the Southern Region and eventually diesel electrics.

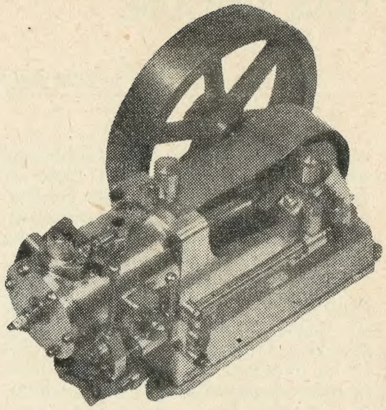
Mr J. C. Sparks, the works manager, told a correspondent of the *Manchester Guardian* that a locomotive craftsman could turn to any kind of engineering.

Mr R. Burns, a charge hand who had helped to build 76114, was not perturbed. His trade was locomotive engineering and it made no difference to him whether his creations were powered by steam or fuel oil.

Even the driver of 76114, who admitted to "48 years of mucking about with steam," made a positive declaration in favour of its diesel successor. Diesels were so much cleaner, he observed.

So another chapter in railway history is closed, but the book is not finished, for we must turn the page to the next chapter. And, anyway, Swindon and Crewe will still be building steam-operated types for some while yet.

A 60 cc. HORIZONTAL GAS ENGINE—10



And now, in conclusion, EDGAR T. WESTBURY deals with the control gear and final assembly

THERE are several ways of arranging the connection from the governor to the throttle lever of the carburettor, and, in the event of the latter being of a different type to that specified, some modifications in this respect will be inevitable. Where possible, however, simple and direct linkage is desirable, and the arrangement shown in the elevation and plan enables this to be carried out with the minimum complication.

As the arcs of motion of the throttle lever and control lever are in different planes, the link connecting them should be capable of articulation in both planes; the use of ball joints enables this to be done simply and without lost motion. I have not considered it necessary to make full working drawings of the components required, as they are identical with those used in motor-car and aircraft engine controls—on a smaller scale. I have also seen miniature joints of this type on the surplus market, though I cannot state if or from whom they are obtainable at present.

However, they are not difficult to make and the spherical turning device recently described by Duplex would enable the ball ends of the studs to be turned accurately. These studs are screwed and nutted to secure them in the ends of the respective levers.

If desired, the link with the two ball sockets may be made in a single piece, instead of two pieces connected by a screwed rod as shown, though the latter enables the relative positions of the levers to be adjusted. If the ball ends of the studs are $\frac{3}{16}$ in. dia., the sockets may be tapped $\frac{1}{4}$ in. × 40 t.p.i., and the side hole is then drilled $\frac{1}{8}$ in. and countersunk with a centre drill to provide the required latitude of movement.

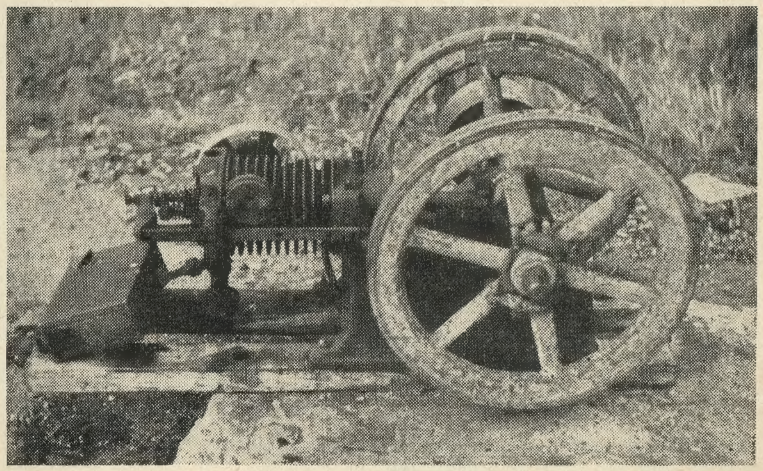
Positions should be adjusted so that the control lever is approximately vertical, and the throttle lever square with the cylinder axis, when the governor is at the middle of its working range. Some adjustment of the throttle barrel, in relation to the lever, may be found necessary to secure the required range of speed control; obviously it must be arranged so as to close by moving the lever towards the cylinder base.

Other types of carburettors may be less suited to governor control than that specified; plunger throttles, generally, have excessive friction compared with the rotating type, but the butterfly type has the least friction of all. If a plain (non-compensated) type of carburettor is employed, governor control may be found quite impracticable as, although the engine will slow down all right when throttled, it may lose mixture strength and peter out —and at least fail to recover speed, when the throttle is re-opened.

Unless the internal springs of the governor have been pre-adjusted to operate at exactly the required speed, an extra spring must be applied to the control gear. The arrangement diagram shows the simplest method of fitting this spring, by adding a short lever (similar to one arm of the control fork) to project downwards from the control shaft and attaching a tension spring between this and some convenient fixed point.

To enable the speed to be adjusted within a fairly wide range, the lever carries a screwed eye bolt with a knurled nut, capable of being operated while the engine is running. Note that in order to work perfectly freely, the bearing for the nut should be capable of swivelling; this may be done by riveting it into the eye of the lever just sufficiently tight to keep it in place while allowing it to turn.

If no governor gear is fitted to the engine, the throttle lever of the carburettor may be connected to a conveniently situated hand lever by any suitable means, such as a Bowden



Side view of the derelict Amanco engine showing flywheel governor, cooling fan and suction carburettor

GAS ENGINE

continued

cable. But if it is not considered necessary to provide such form of control, the throttle should be frictionally loaded by a double-twin spring washer fitted between the throttle cover and lever.

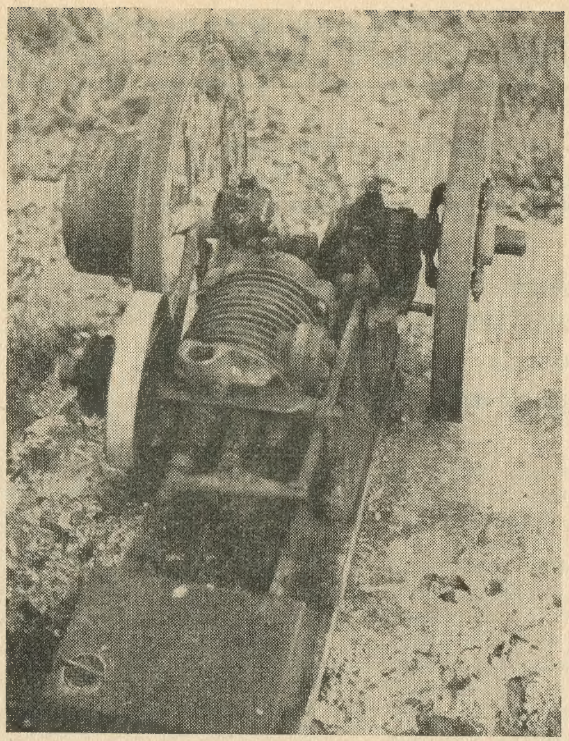
For some purposes, such as driving a lathe, hand control may be preferred to constant-speed governing as it enables a fair range of mandrel speed to be obtained without shifting belts or other manipulation of the machine; but it also limits power at lower speeds, as compared with the mechanical advantage gained by lowering speed ratio in the usual way. However, it may be said that the ability to alter speed does give an i.c. engine at least one advantage over the normal type of electric motor which can only work at a fixed speed.

FUEL FEED FILTER

Although common sense dictates that every care should be taken to avoid getting foreign matter in the fuel reservoir, the fitting of a filter (part No 29) in the feed line is a very desirable extra precaution. The cylindrical sleeve of metal gauge around the feed pipe forms a very effective filter, and is largely self-cleaning; its construction needs little explanation as it is made by rolling a piece of " petrol gauge " around a wooden rod and soldering the seam, then soldering a disc of gauze or a metal cap in the end before attaching the other end to the spigot of the union fitting which screws into the tank.

Take care to avoid an excess of solder when making these joints or the solder will spread over the gauze by capillary attraction and block it very effectively. Note also that the sleeve must be small enough in diameter to pass through the hole in the reservoir.

It has already been mentioned that the base of the reservoir could be deepened locally to enable the fuel to be used to the last drop practically; if this is done, the gauze sleeve and internal pipe must be suitably lengthened to take advantage of this added depth. Instead of an internal feed pipe and a union joint at the top of the fitting, the main feed pipe may be made with an extension to go right down into the tank, in which case the top fitting of the filter is simply drilled to serve as a guide for the pipe. Whatever method is employed, however, it is essential that

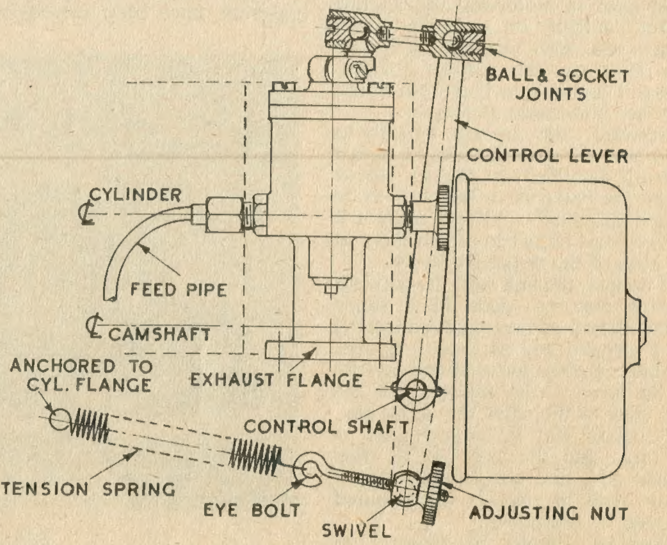


End view of the Amanco engine showing exhaust valve rocker and interceptor catch on the push rod

any feed joints should be perfectly tight, or the suction will be lost and no fuel will be fed to the jet.

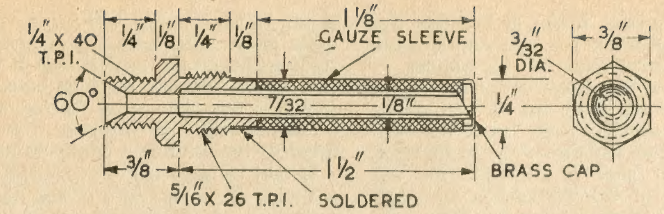
When starting the engine from cold, it will be found necessary to open the jet from half to one turn beyond the normal running position to obtain sufficient suction; if you object to this, a priming device, as already mentioned, may be fitted to the carburettor. If the main reservoir is used for paraffin fuel, the auxiliary petrol tank for starting and warming up may be located level with, or slightly above, the jet, in which case no priming will be necessary.

The filler cap for the fuel reservoir (part No 32) is a very simple item;



CONTROL GEAR ARRANGEMENT

NOT TO SCALE



SUCTION PIPE & FILTER (29) 1 OFF BRASS

it can be turned from solid aluminium alloy or some other convenient material at one setting. A die may be used to cut the thread if it is available in the required size and pitch otherwise it must, of course, be screwcut. In either case, a relief groove should be turned, preferably with a round-nosed tool about $\frac{1}{16}$ in. wide, at the shoulder of the thread, to enable it to screw right home against the seating.

The small vent hole is necessary to prevent vacuum locking of the fuel feed, but it need not be as large as that shown, provided that it can be kept clear of obstruction.

LUBRICATION

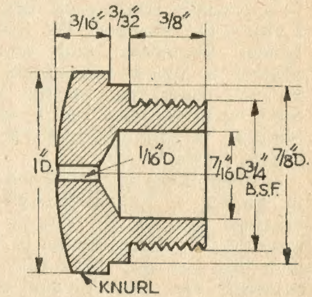
Many small engines of this type have had no other provision for lubrication than simple oil cups fitted to the two main bearings and the cylinder skirt, but it is obvious that for long continuous periods of running something more reliable than this is necessary. Sight-feed drip lubricators were fitted to most industrial engines, and this type could be constructed in a suitable size for fitting to this engine. On the converted gas engine which I described some years ago, the type of sight-feed lubricator as used on the Myford ML7 lathe was used, and gave very good results, though it is somewhat oversize for a small engine.

The wick tube or syphon type of lubricator is quite satisfactory for continuous feed of a small quantity of oil, and may be made in cylindrical form for fitting to individual bearings or in a rectangular box form with multiple wicks and feed pipes to the bearings. This type could be neatly and compactly fitted over the cylinder-support flange.

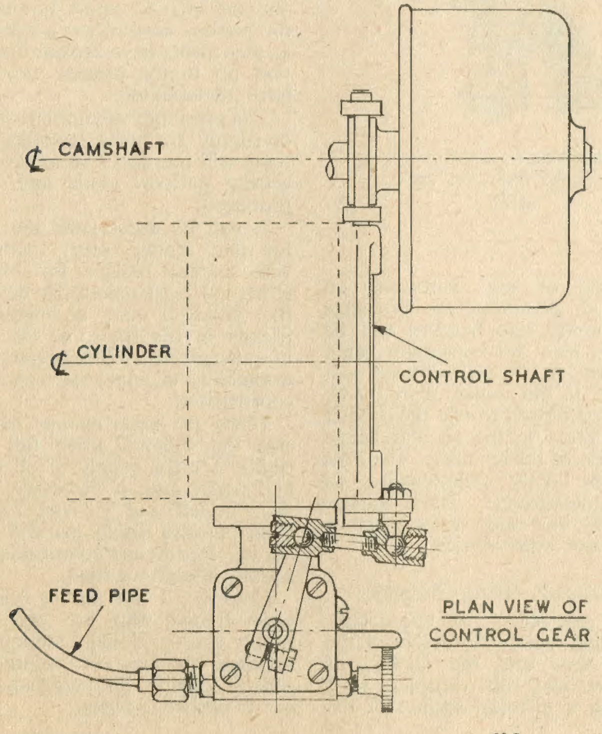
With either kind of lubricator, the feed to the cylinder wall may be either through a countersunk hole drilled in the projecting skirt or an extension pipe just beyond it to drop oil on the piston at the end of its stroke. In the latter case, however, it will be necessary to fit a collector funnel to the piston or connecting-rod to lead oil to the little-end bearing, otherwise much of the oil will drip into the crankpit without being utilised.

Direct force-feed of oil to the bearings is hardly practicable in an open engine, but many of the larger engines employed a pump to lift oil to a gallery from which the bearings were supplied by gravity. This method has the advantage that it does not rely on the care and watchfulness of

(32)



the operator; it would be quite practicable in the present case, using a small plunger pump driven from the camshaft and submerged in an oil tank. To prevent overflow from the gallery, excess oil is returned to the tank by a spill pipe after the specified level is reached.



PLAN VIEW OF CONTROL GEAR

A 2/3 SCALE CENTAUR

The engine illustrated in the heading of the last three instalments of these articles was constructed by Mr Byron G. Barnard, and was one of the first engines to be completed to this design. It was not, however, made to the specified dimensions, but was reduced to two-thirds scale to suit convenience in construction, particularly in view of the fact that a Dolphin engine of 1 in. bore had previously been built, and a lap for the cylinder—also spare piston rings of this size—were available.

It has been fabricated mainly from duralumin, the body components being fastened together with Allen screws, and the base machined from the solid.

The cylinder head is of gunmetal, with the rocker brackets brazed on. One or two details of the design have been modified, including the contact breaker, which is of the spring-blade type, and it is intended to use the Dolphin carburettor for initial running tests. The only casting employed

GAS ENGINE

—continued

is the flywheel, which has straight spokes, as the curved-spoke type could not be obtained.

AN IW "SPECIAL"

Mr Sinclair, formerly of Ventnor, Isle of Wight, has built a very interesting horizontal engine, based on my articles on converting an old gas engine published in MODEL ENGINEER some years ago. I first saw this engine in a partially constructed form when I visited the Newport IW Society of Model Engineers, and was very pleased to renew acquaintance with it, now completed, on the Malden SME stand at this year's ME Exhibition. A photograph of this engine is seen on the cover.

It differs from my converted engine in having a full crankshaft, with bearings both sides, but in other respects the general design is similar, including the use of a spur-geared camshaft and long pivoted rockers operating vertical exhaust and inlet valves; the suction-fed carburettor and exhaust silencer also follow my description.

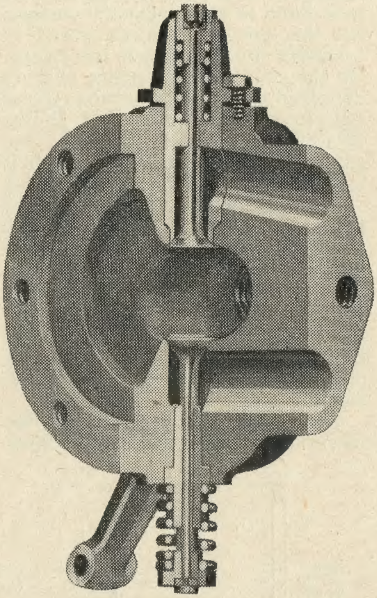
The timing gears were obtained on the surplus market, and a contact breaker made from car ignition parts is fitted. Like the previous example, it is of fabricated construction, and the general appearance is compact and workmanlike; I have little doubt that it performs satisfactorily.

AN INTERESTING ANTIQUE

In the course of correspondence arising from this series of articles, several readers have recalled experiences with gas engines of earlier days, and it is quite clear from these that steam engines have no exclusive monopoly of nostalgic memories. They have fully confirmed my views that the old gas and oil engines were thoroughly reliable, efficient and economical for all industrial purposes; many of them had a record of faithful service for as long as 50 years, and their passing is regretted by all who knew them well.

Mr A. E. Bowyer-Lowe has sent me some photographs of an old air-cooled petrol engine found derelict at Spean Bridge. It is rated at 2¼ h.p., having a bore of 4 in. and a stroke of 6 in. Even without the particulars quoted from the nameplate, I could have identified it as an Amanco engine (Associated Manufacturers Co. Ltd, Indiana, USA), as this type was very common for agricultural work in the early years of this century.

Points of interest about this engine include the early use of air cooling for stationary work (note the belt-driven fan) and the suction carburettor. Ignition gear is missing, but was usually of the low-tension type with internal breaker, current being supplied by a magneto driven from the timing gears or, occasionally, by a battery and single-wound self-induction coil.



Right-angle section of cylinder head, on valve axis

Apropos of my comments on methods of governing, the flyweights in the timing side flywheel will be seen, and also the interceptor catch for holding up the exhaust push rod; the latter, in the course of its travel, was also employed to trip the contact breaker, fitted to the circular flange on the side of the cylinder. The inlet valve was lightly spring-loaded, to work automatically. These engines were made in a wide range of sizes, both air and water cooled.

CYLINDER HEAD DESIGN

I have received one or two queries from readers about the design of the cylinder head and the method of fitting the inlet valve housing, so I am giving a pictorial section of the head, which I trust will make this quite clear. The section is taken at right angles on the vertical axis of the two valves, showing the inlet housing with the complete valve, spring and collar assembly in position; this is fitted to the head as a complete unit.

It will be seen that the housing is a sliding fit in the bore of the head, and abuts on the angled seating near the base of this bore, where it is held down by the two studs in the flange. A clearance between the flange and the top face of the head is, therefore, essential, and the seating must be accurately machined to ensure a perfect gas seal; it is also important that the fit in the main bore should be close, to avoid air leakage.

A suggestion is made that the upper guide of the housing should be vented to prevent air being compressed in the spring compartment. If the fitting of the parts is good enough to compress air it will be pretty clever workmanship; but my experience is that this rarely occurs, and would do no harm if it did; but it could easily be prevented by cutting one or more grooves in the spring retaining collar.

CASTINGS FOR THE CENTAUR

At the time the design for this engine was first prepared, I put in hand negotiations with an ME advertiser for the supply of castings to be made available to constructors. I am very sorry to report, however, that for reasons beyond my control, these arrangements have broken down, and that up to the present, no castings have materialised.

The possibility of alternative sources of supply are being investigated, but there will inevitably be some delay in getting patterns made and castings produced.

It will be appreciated that I (and for that matter, other contributors who submit designs for ME constructors) must necessarily depend on the goodwill and co-operation of friends in the trade, as the success of a design can only be assured by the availability of approved materials for construction.

There are some readers who consider that I should accept full responsibility for the supply of all castings and parts, and, if necessary, market them myself; but for ethical reasons, I have always strictly avoided becoming involved in any commercial transactions of such a nature.

However, I am always willing to assist traders who are prepared to supply constructional materials of the required standard of accuracy and general quality, in accordance with my published designs. ■

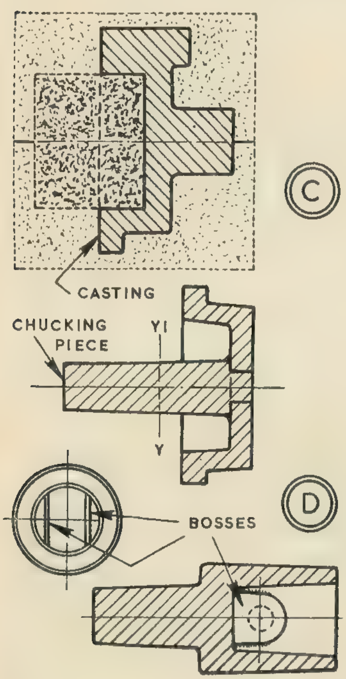
PATTERNS for HOLLOW CASTINGS

By Geometer

By hollowing or "coring" certain castings considerable advantages can often be obtained—over-machined from the solid or built-up components—in saving of weight, material, time, effort and cost.

Frequently, too, little or no extra work is involved on a simple pattern; and on occasion it is possible by slight adaptation of design to utilise such a pattern for a hollow casting where the orthodox method would be to employ a special core, demanding a core box, in conjunction with the pattern.

Castings having round straight holes on the main axis, either right through or partly through, can be produced from simple patterns by embodying core prints of suitable size

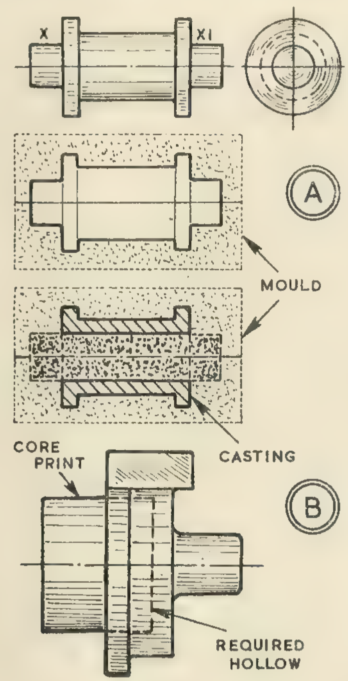


in the wood patterns as they are being turned. Depressions are then formed in the moulds whereby the actual cores can be located.

Where a cylinder casting (for a steam engine, for example) must have a hole cored right through, the simple pattern, as at *A* (top) has a circular core print at each end, *X*-*X*1. After moulding (centre), the result without a core would be a solid casting the same shape as the pattern, but by placing a core through the mould the casting is left with a bore (bottom). The core, of course, being of sand like the mould, can be knocked out when the metal has cooled.

The same principle obtains when the casting is partly hollowed—as for the crankcase halves of a model petrol engine. The simple pattern, as at *B*, carries the core print one side, and to avoid any tendency for the core to over-balance when it is being placed in the mould, the length of the core print should rather exceed the depth of the required hollow. The casting produced is as at *C*.

The rules for applying this method of coring are quite straightforward. It is essential for the cored hole to be small enough for the bore of the



casting to clean up properly in machining. For this, in small sizes, it is necessary to have between $\frac{1}{16}$ in. and $\frac{1}{8}$ in. depth of metal—which means the cored hole must be $\frac{1}{8}$ in. to $\frac{1}{4}$ in. less in diameter.

As the core is to be provided by the foundry, a dimension should be chosen for it which is certainly a whole $\frac{1}{8}$ in., and preferably a whole $\frac{1}{4}$ in., even though this may mean leaving rather more metal than necessary. If an "odd" dimension is chosen for the core, that actually used may be smaller, and the cored hole eccentric through the casting. Enough metal would be left, of course, but the initial machining cut would vary considerably in depth.

To call attention to the fact that the projections on patterns are core prints and not bosses, they should be painted red (grey or black for the rest of the pattern). A label may also be tied to the pattern with instructions such as: $\frac{3}{4}$ in. hole cored right through. In the case of a core partly through, as at *C*, some instruction must be given, either on a label or painted on the pattern, such as: 2 in. dia. hole cored $\frac{3}{4}$ in. deep from face.

Where a casting is to be partly hollow, yet the hollow is not circular, or if circular contains bosses or ribs, then production must be from a simple pattern or a special core box must be used—the latter best avoided if possible.

For example, the endplate of a two-stroke crankcase may be hollow to save weight, or contain a boss for the rotary valve shaft, with another for the inlet port. Then the pattern can be as at *D* (top). The main portion can be machined hollow, and the boss, ending at *Y*-*Y*1, but with chucking piece attached, glued in like that for the inlet port. With tapers on the faces, the pattern can then be moulded without a core.

The principle is applicable also to piston patterns (bottom) down to about $1\frac{1}{4}$ in. bore—best turned from boxwood with tapers inside and out —then the bosses, extending up to the crown, are glued and tacked in. ■

ALLCHIN ME TRACTION ENGINE

W. J. HUGHES deals with the construction of the footplate and footboard in this instalment and suggests an easy method of armouring the miniature water hose

Continued from 25 July 1957, pages 116 to 119

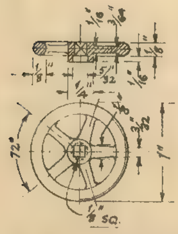


Fig. 1: Brake hand-wheel

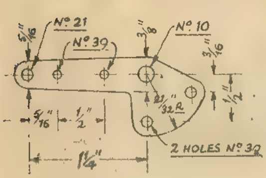


Fig. 2: Brake levers

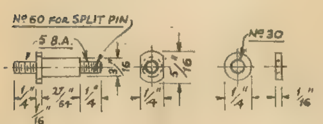


Fig. 3: Brake pivot pin and washer

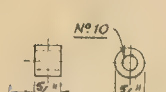


Fig. 4: Distance collar

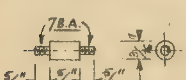


Fig. 5: Lever distance stays

Fig. 6: Brake-strap pins and washers

THERE remain a few items for the brake, commencing with the hand-wheel (Fig. 1). This is made in the same way as the steering wheel, but is simpler because there is no boss for a handle. The spokes should be filed to oval section, a rather fiddling but necessary job.

In making the brake levers (Fig. 2), follow the usual procedure by setting out one lever first, on a piece of 18-gauge mild-steel sheet. Cut it out roughly to shape, not quite to the line; then lay it on the sheet, scribe round it, and cut out the second one. Clamp the pieces together, and drill the two No 39 holes.

Fasten the levers together with 7 BA screws and nuts through these holes, and drill the remaining holes. Finish filing to shape while both pieces are clamped together, and drawfile the edges. Remove the bolts.

A few simple turning jobs follow, in making the brake pivot pin and washer (Fig. 3), the distance collar (Fig. 4), the two distance stays (Fig. 5), and the two brake-strap pins and washers (Fig. 6), all of which are of mild steel.

Before making the brake strap (Fig. 7), it will be necessary to assemble temporarily all the other parts of the brake assembly, the bracket with screw and levers being bolted to the tender and the brake drum fitted on the third shaft.

Set the seven brake blocks in their groove—a strip of scotch tape will hold them in place—and see that the levers are at an angle about 5 deg. below horizontal. You can now take the actual length of the brake strap by bending a piece of copper wire round one pin, passing the wire round the brake blocks, and then round the other pin.

Slide out the two pins, remove the wire, and at one step you have the length of the strap and the distance between the securing loops.

For the strap itself it is advisable to use spring steel, and I have an

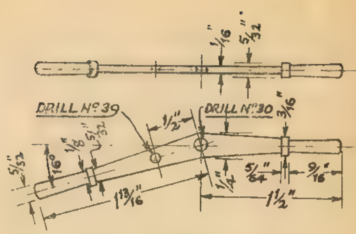


Fig. 8: Regulator lever

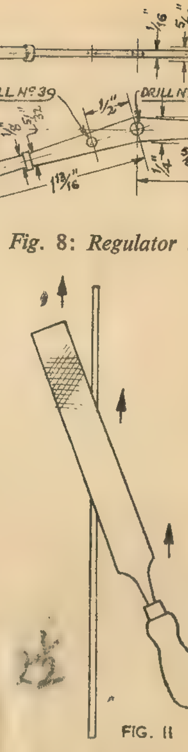


Fig. 11: Filing the regulator reach rod

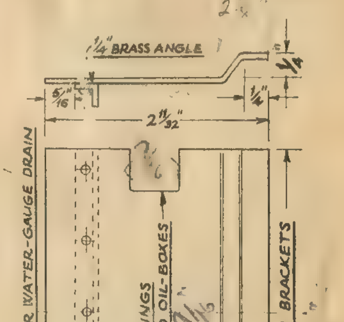


Fig. 13: Forward footplate

old clock spring in my junk box which will serve beautifully. It will need softening, which I shall do by passing it slowly through a gas flame. Failing clock spring, you will probably find that the strip steel used to secure packing cases will do, but without heating.

Whichever you use, it is not a difficult job to make the strap, and

9 5/8" ROD 1/8" DIAm

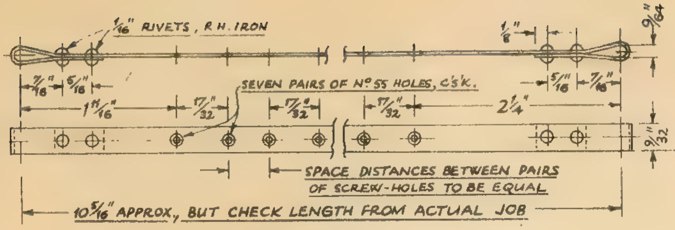
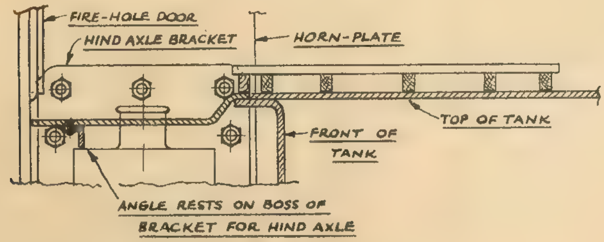


Fig. 7: The brake strap



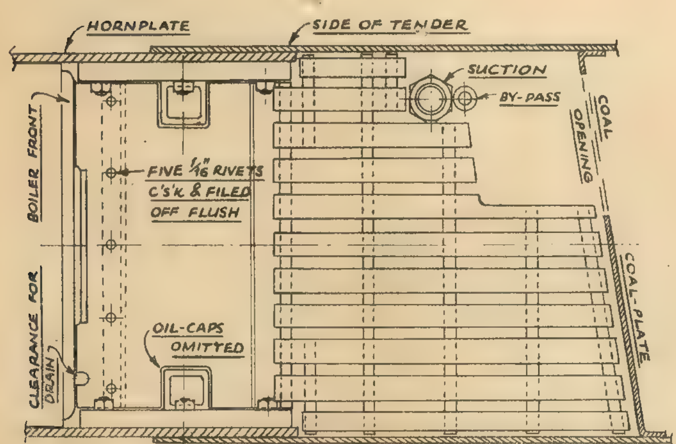


Fig. 12: Arrangement of forward footplate and footboard

screw the blocks to it. Use brass screws as specified, so that if the blocks wear, the screws will not score the brake drum. Do not yet drill the holes and insert the rivets for one end loop, so that a check assembly can be made again before doing so.

For our purpose the brake should be "hard on" with the levers approximately horizontal, and a couple of turns of the screw should fully release it, the natural springiness of the steel holding the shoes "off." If all is satisfactory, the last loop may be drilled and riveted.

Checking the list of parts not yet described, I find certain regulator fittings. First of these is the double-handed lever (Fig. 8), by means of which the engine could be controlled from either side of the footplate. It is made in a similar manner to the gear change and reversing levers, with the lever itself cut from bright mild sheet (16-gauge), and with separate turned handles silver soldered on to it.

REGULATOR PINS

The three regulator pins again are simple turning jobs; the front one (Fig. 9a) is secured by split pin and washer in the fork of the reach rod, but the back one (Fig. 9b) is tapped at the end to screw into the fork. The pivot pin (Fig. 9c) has a 1/8 in. dia. shoulder on which the lever swivels, and a spigot screwed 3/32 in. Whit. or 7 BA, whichever thread you tapped into the boss of the regulator bracket.

The regulator reach rod (Fig. 10) is forked at each end, the forks being made by methods already described. Note that the rod is "fish-bellied," that is, thicker in the centre than at the ends, the taper being rounded down towards the ends. This is best done by filing, holding one end of the rod in one hand, the other end resting flat on the bench. The file is now used in the direction sketched (Fig. 11), while the rod is rotated between strokes.

Again the length should be checked from the actual job, with the lever right back and the regulator valve fully closed. Finally the ends of the rod are silver soldered into the holes in the forks.

FOOTPLATE AND FOOTBOARD

Because the firehole door of our model has had to be placed relatively lower than that of big sister, the forward footplate has to be dropped (Fig. 12). This is simply accomplished by bending it down 1/4 in., as shown in Fig. 13. It should be cut from 18-gauge mild-steel plate, and should fit snugly, but not tightly, between the tank top and the boiler front. At the sides it fits similarly between the hind axle brackets, and is filed out to clear the oilboxes. At the front end it is supported by a length of 1/4 in. brass angle riveted underneath, which rests on the bosses of the hind axle brackets.

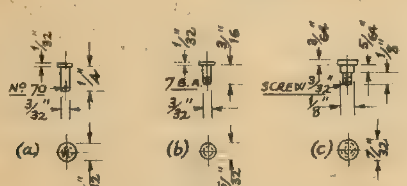


Fig. 9: Regulator pins (a) front; (b) lever fork; and (c) lever pivot

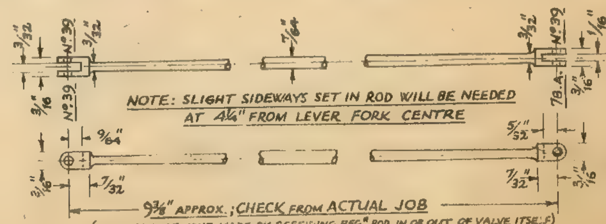
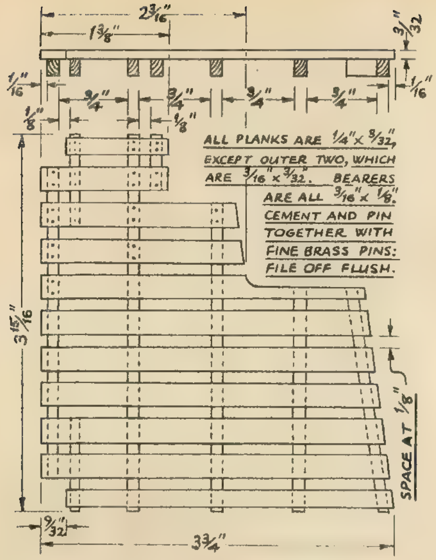
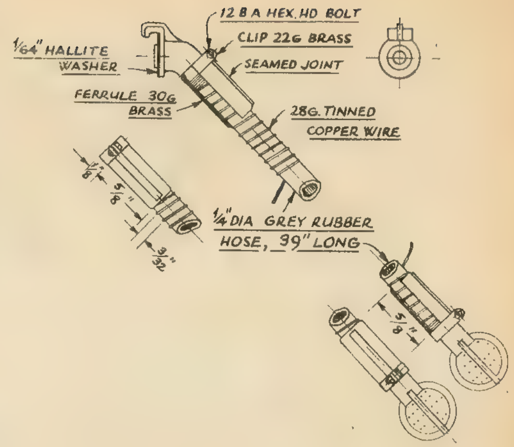


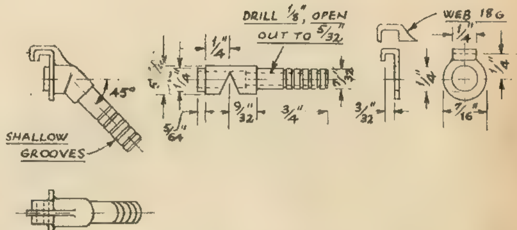
Fig. 10: Regulator reach rod



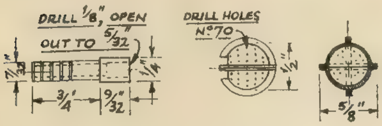
Left, Fig. 14: Footplate footboard



Right, Fig. 15: Arrangement of water-lifter hose, grip connection and strainer



Below, right, Fig. 16: Details of the grip connection for hose



Left, Fig. 17: Details of strainer

As with the boiler-side footboard, that for the footplate should be made from wood which has neither appreciable grain nor figure.

As indicated in Fig. 14, the bearers are $\frac{3}{16}$ in. × $\frac{1}{8}$ in. in section, and the planks are $\frac{1}{4}$ in. × 3/32 in., except for the two outer ones which are only $\frac{3}{16}$ in. wide. Note in Fig. 12 that at the offside the footboard is cut away to clear the suction and bypass unions, and to give access to the coal opening.

Before assembly the parts should be well glasspapered, finishing with no coarser than No O grade. The joints are cemented, and pinned with fine brass pins. When dry, cut off the surplus of the latter, and file flush with a small smooth file, finishing again with No O paper. This will give the impression of brass screws. Two or three coats of clear varnish or cellulose, with rubbing down between coats, will complete the job.

WATER-LIFTER HOSE AND FITTINGS

The hose for the water-lifter (Fig. 15) is fitted at one end with a brass strainer, and at the other with a grip connection which simply clips on to the water-lifter.

For the hose itself 39 in. of rubber or possibly plastic hose $\frac{1}{4}$ in. dia. is required, pale grey in colour. On full-size engines the hose was canvas covered, and so on a model the red or black hose one sometimes sees is out of place. If plastic is used, it must be matt surfaced, not polished.

The tube of the grip connection (Fig. 16) is turned from brass rod to the dimensions given. Cut out the flange from 18-gauge brass sheet—the $\frac{1}{4}$ in. hole should be a good tight fit on the corresponding spigot of the tube. Bend the lug or clip over a scrap of 13-gauge material.

Anneal the tube by heating to red, and allowing to cool slowly. File the 45 deg. notch, and bend to form the angle. Emery the spigot, and press the flange on to it. Fit the web, cut from 18-gauge sheet, and silver solder the joints at one heat, using Easyflo. Pickle, wash, and clean up.

For the strainer (Fig. 17), a similar tube, but differing in length, is turned, also from brass rod. To make the ball part, two hemispheres are required, and you will need to make a punch and a die to form these (Fig. 18).

Grip a length of 1 in. dia. mild steel or brass rod in the chuck, face the end, centre, and drill out to $\frac{1}{2}$ in. dia. × $\frac{5}{8}$ in. or $\frac{3}{4}$ in. deep. Slightly radius the edge of the hole, and part off at $\frac{5}{8}$ in. or so. This is the die.

For the punch, turn the end of a piece of $\frac{3}{4}$ in. rod to a diameter of $\frac{7}{16}$ in., and to a depth of $\frac{1}{4}$ in. Round off the end to a half-ball shape. Part off at a length suitable to be held as you hit the top with a hammer, say $2\frac{1}{2}$ in. to 3 in. This is the die.

Cut out a couple of circles of 24-gauge brass sheet about $\frac{7}{8}$ in. dia., and anneal as you did the grip connection tube. Clean up with emery. Place one disc centrally over the die, with the ball end of the punch on its centre, and strike the other end

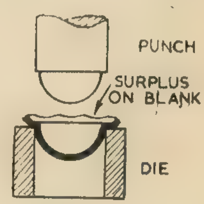


Fig. 18: Using the punch and die

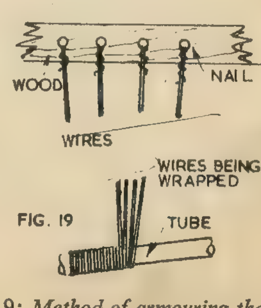


Fig. 19: Method of armouring the hose

Fig. 20: *Boiler filling plug*

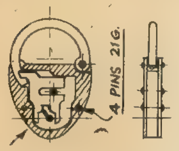


Fig. 21: *Showing front cover of padlock removed, the key partly turned and bolt ready to slide*

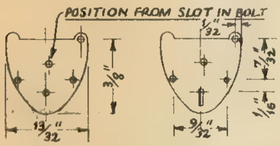


Fig. 22: *Arrangement and details of the padlock for the toolbox*

Fig. 23: *The lock body*

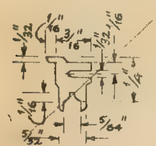


Fig. 24: *The lock bolt*

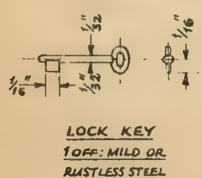


Fig. 25: *The lock key*

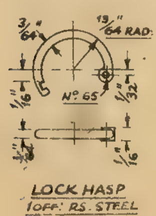


Fig. 26: *The lock hasp*

smartly with a hammer. After two or three blows there will be a considerable dent in the circle, but the edges will be all wavy.

At this stage the brass will be work-hardened, and require annealing again. Do this, pickle, and then repeat the operations until you have the result shown in Fig. 18—you may or may not have the crinkled surplus sketched; it will depend on the ductility of your brass to some extent.

Cut off any surplus to leave the flange a full $\frac{5}{8}$ in. overall diameter. Place the hemisphere upside down on a flat surface, with the die on top, and tap the latter down to flatten the flange properly. Rub on coarse emery to clean the flange.

Make a second hemisphere in exactly the same way, and in both file the $\frac{1}{4}$ in. gap where the tube is to fit, leaving just a tiny bit to be filed out after they are soldered together. This can be done next, with No 1 silver solder, but be careful not to use *too* much heat—24-gauge brass will easily burn !

Now cut out and fit the other web —18-gauge brass—and fit the tube. These should be soldered on with Easyflo.

All that remains is to drill the No 70 holes, and these should be regularly placed.

ARMOURING THE HOSE

Wrapping the wire armouring round the hose could be difficult, to get even spacing of the coils, but I am indebted to Capt. J. C. Davis, RN, of Crowborough, for telling me the method he used. (You will undoubtedly recall that Capt. Davis' Allchin was featured on MODEL ENGINEER cover some time ago.) We will adopt his method.

The 28-gauge *tinned* copper wire should be readily obtainable at a large electrical store; about 100 ft will be required. You will need also a room, corridor, or open space about 25 ft long; if you have to use the garden, choose a fine day because the job will take a couple of hours or so !

Drive four nails about 1 in. apart into the edge of a piece of wood, leaving the heads protruding. Fasten this wood at one end of your space, and secure one end of the wire to one nail. Walk down the corridor, unreeling the wire as you go. Cut off about 25 ft, and temporarily fasten this end to another piece of wood. Repeat this operation three times, and you should have four 25 ft lengths of wire, nicely parallel and not tangled. Have the rubber tube handy, with a little excess in length.

Unship the free ends of the wires from their temporary fastening, keeping them taut and untangled, and bring them close together but side by side. Now start to wrap them round the tube, rolling the latter as you advance slowly and keeping the successive coils touching one another. Maintain a light tension constantly on the wires.

When the wrapping is complete, then, the rubber of the tube should not be seen at all, at this stage. Fig. 19 sketches the work in progress.

As you approach the end of the tube with the wrapping, insert the grip connection, and carry on wrapping to within $\frac{1}{4}$ in. or so of its shoulder. Cut the right-hand wire, and finish it off by wrapping several times closely, finally inserting it under the last couple of loops and pulling tight. A tiny touch of solder will not come amiss here.

Now retrace your steps, unwrapping the three remaining wires as you go, which will leave the single wire wrapped in nice evenly spaced coils on the tube. Arriving back at the start, cut off any surplus from the tube, insert the strainer, and secure the single wire as with the grip connection.

The ferrules are made from 30-gauge brass, or brass shim, and should have a seamed joint. Note that this joint does not come quite to the inside end of the ferrule, which is swaged down to touch the rubber tube; this swaging may be pressed down with a screwdriver blade.

Lastly, make and fit the two small brass straps, $\frac{1}{8}$ in. wide, and secure them with 12 BA hexagon head screws and nuts.

Another detail which we haven't dealt with up to now is the boiler filling plug (Fig. 20), which screws into the cylinder flange. This is turned from phosphor-bronze rod. The hexagon head may be filed up, if you have a lathe filing-rest, or end-milled to shape. When fitting to the hole in the flange, use a thin Hallite washer under the head.

TOOLBOX PADLOCK

If you wish your model to be *really* detailed, a padlock for the toolbox is a must, though it does involve some rather delicate work. Not too delicate, though, for a fellow who has got as far as this, and how satisfying to produce a tiny key, put it in the lock, open up the toolbox, and produce a kit of scale-size tools. But we anticipate !

Fig. 21 shows the arrangement, the key being in the lock, partly turned, and ready to slide the bolt back. There are no complications of levers or springs, for if the bolt is well-fitted they are not necessary—we're not locking up the Crown jewels !

●*Continued on page 704*

NEWBURY—A 4-4-0 TENDER ENGINE FOR BEGINNERS

The ME gauge 1 steam locomotive

This week MARTIN EVANS discusses the connecting-rods and motion brackets

(Continued from 7 November 1957, pages 629 to 631)

HAVING dealt with the cylinders, slide bars and crossheads, I come now to the connecting-rods.

These can be cut from $\frac{3}{8}$ in. × $\frac{1}{8}$ in. bright mild steel. It is hardly worth while milling these as they can be sawn and filed up quite quickly. Mark out the outline of the rods and start by drilling the holes, which can be made finished size.

If anyone prefers the rods to be fluted, this may be done by bolting a length of heavy steel angle to the vertical slide (a piece 8 in. long × $1\frac{1}{2}$ in. × $1\frac{1}{2}$ in. × $\frac{3}{16}$ in. does very nicely) and setting the angle cross-wise in the lathe, i.e. with the table of the vertical slide facing the lathe mandrel.

The connecting-rod blanks may then be laid on the horizontal side of this angle and held down by 5 BA screws. To obtain a properly tapered flute, the little-end can be held down by one screw but the big-end should be clamped down by a short piece of flat steel about $\frac{3}{8}$ in. × $\frac{1}{8}$ in. section, two screws being used, through clearing holes in the strip into tapped holes in the angle. The big-end may then be swung round to give the required taper.

A suitable cutter, which could be held in a collet or in the three-jaw, would be one 1 in. to $1\frac{1}{2}$ in. dia. and $\frac{1}{16}$ in. to 5/64 in. wide. If anyone has a Woodruffe cutter of this width, this would be ideal as the diameter is small.

The outside of the rods can then be completed as described for the coupling rods and the ends case-hardened.

The motion brackets consist of a piece of $\frac{1}{16}$ in. brass or steel sheet, sawn and filed to shape and attached to the frames by $\frac{1}{4}$ in. × $\frac{1}{4}$ in. × $\frac{1}{16}$ in. brass angle. Be careful to get the slots for the slide bars exactly in line and the correct distance from the frames. (The latter can best be checked by applying a pair of inside callipers between the front end of the slide bar and the frame.)

The cylinders may now be packed, using oiled paper between the block, steam chest and covers, and graphited yarn in the pistons and glands.

ECCENTRICS AND STOP COLLARS

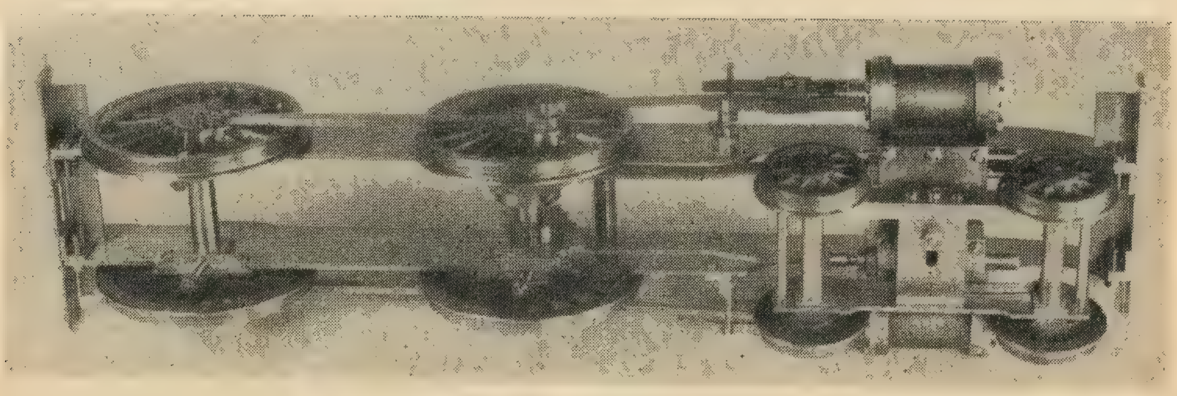
The eccentric sheaves are turned from $\frac{3}{4}$ in. dia. mild steel. Turn the outside and face one end, then remove from the three-jaw and mark the centres for the axle hole and the stop pin. Now mount in the four-jaw chuck and set to run true about the centre for the axle hole; drill and ream $\frac{5}{16}$ in. from the tailstock.

Part off and repeat for the second sheave. Drill No 31 for the stop pin, ease the hole slightly with a $\frac{1}{8}$ in. dia. parallel reamer and press in a length of $\frac{1}{8}$ in. dia. silver steel.

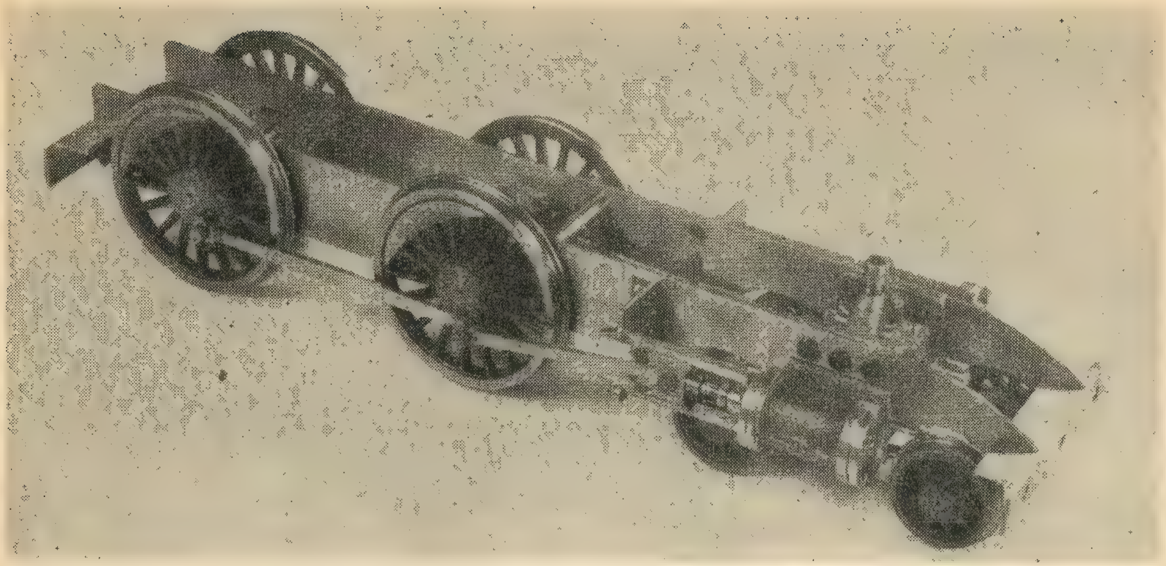
The stop collars are also turned from $\frac{3}{4}$ in. dia. b.m.s., drilled and reamed $\frac{5}{16}$ in. while still in the lathe, and the gap hand-filed. A hole is drilled and tapped 6 BA on the opposite side for a setscrew—a cheesehead screw of such a length that the head just clears the stop collar when right home.

Castings are used for the eccentric straps. Clean up the castings with a file, drill right through with a No 50 drill for the securing bolts, then saw in half. Tap the front halves 8 BA, open out the rear halves with a No 43 drill and clean up the " sawn " faces by rubbing them on a smooth flat file laid on the bench.

The two halves can now be numbered, screwed together, and the whole held in the four-jaw for boring and facing one side. They should not be made too close a fit on the sheaves as it is easier to tighten them up afterwards than it is to enlarge the bore. To face the other side they should be mounted on a stub of



The underside of the completed chassis



The chassis ready for the air test

b.m.s. rod held in the three-jaw (turned to a diameter slightly more than the sheaves themselves) and held by their own bolts.

The slot in the front of the straps for the eccentric rods could either be milled out with a $\frac{1}{16}$ in. thick slotting cutter (the strap being held in the lathe toolholder) or it could be sawn and filed.

The eccentric rods are cut from $\frac{5}{16}$ in. b.m.s. strip, the 3/32 in. dia. hole for the valve crosshead being case-hardened and the rod riveted to the strap with two $\frac{1}{16}$ in. dia. countersunk rivets.

VALVE CROSSHEADS

The valve crossheads are made from $\frac{3}{16}$ in. square b.m.s. Cross drill with a No 50 drill and slot for eccentric rods with a $\frac{1}{16}$ in. thick slotting cutter, then cut off and mount in the four-jaw for turning the boss and drilling and tapping 5 BA for the valve rods.

If anyone has $\frac{1}{8}$ in. $\times$ 60 t. taps and die, use these on the valve rods and crossheads rather than 5 BA. One side of the fork can now be opened out to 3/32 in. dia. and the other tapped 8 BA.

The valve gear can now be assembled; note that the eccentric sheaves go next to the axleboxes with the flanges on the outside, the stop-collars being set against them with just enough play to allow the eccentric straps to turn freely.

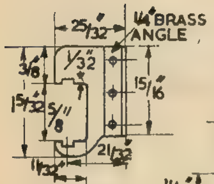
"QUARTERING" WHEELS

The driving and coupled wheels may now be "quartered." Push the second wheel on the driving axle and set it as near as you can by eye, the correct position being that the right-hand crank should lead the left-hand by 90 deg. Now press this wheel right home and push the second wheel on the coupled axle as far as it will go by hand—set this wheel as near as you can by eye.

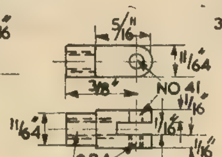
Next pack up the main axleboxes to running position by inserting a strip of metal between the bottom of the axlebox and the hornstay, and screwing up tight.

Slip on the coupling rods, which, if you have not opened out the holes, should be a close fit on the crankpins. By turning the wheels by hand, it will soon be apparent whether the wheels are set at the correct angle; if not, the wheel which is not yet pressed home can be turned one way or the other until the axles turn freely. It is simply a matter of trial and error.

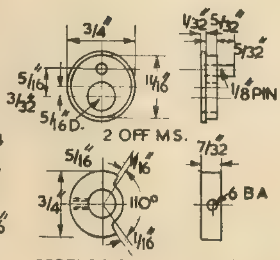
When you are satisfied that everything is satisfactory go ahead and



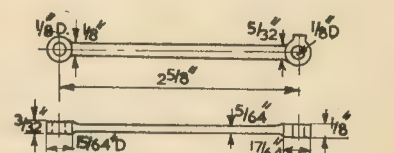
MOTION BRKT. 2 OFF 1/16 MS



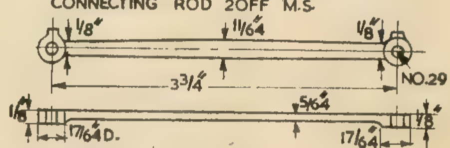
VALVE CROSSHEAD 2 OFF MS



ECCENTRIC SHEAVE AND STOP



CONNECTING ROD 2 OFF M.S.



COUPLING ROD 2 OFF M.S.

4-4-0 TENDER ENGINE . . .

press the final wheel right home; the coupling rods can then be opened out with a No 29 drill, case-hardened, cleaned up and polished.

The next item is the pinning of the main crossheads to the piston rods, so push the piston hard up against the front cover and move the crank on that side of the locomotive to front dead centre.

Press the piston rod back 1/64 in. (i.e. further into the crosshead boss). If you have reamed the boss correctly, the piston rod will stay put for drilling, but if it doesn't seem too firm clamp it to make sure.

On my own job, I put a No 56 drill right through crosshead boss and piston rod, cut off part of the shank of a No 55 HSS drill, tapered this very slightly with a file in the lathe and pressed it home—leaving enough on the outside to grip by just in case it has to come out at any time.

VALVE SETTING

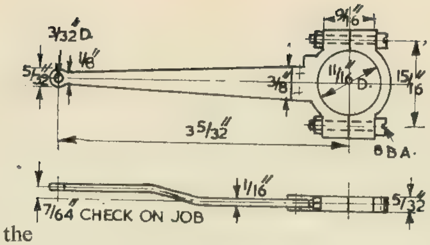
Remove the steam-chest covers, put a few nuts over the steam chests to hold them in position, turn the wheels by hand and watch the valves. Temporarily tighten the stop collars and check whether the valves uncover the ports an equal amount at each end. If they don't, the remedy is to turn the valve crosshead half a turn at a time, one way or the other, until the openings are equal.

To set the valves give the wheels a few turns in a forward direction and then stop them with the cranks at front dead centre. The valve should now just begin to open with the front port showing as a black line. If it fails to do so, turn the stop collar until it does.

Continue turning the wheels in the forward direction until the rear port cracks. If the crank is now at the rear dead centre, the setting is correct for forward gear.

However, if the crank is short of dead centre, the valve is too short and will have to be removed and a thin section of metal silver soldered on that side.

If the crank has gone past dead centre it means that the valve is too long and will have to be shortened. To do this remove an equal amount off *both* ends of the valve, so that the cavity remains in the middle. After replacing, the stop collar will have to



ECCENTRIC ROD AND STRAP
2 OFF MS & PB

be re-set in order to get the valve cracking each port at dead centres.

Now turn the wheels backwards and watch the valve again. If the ports crack at both dead centres, all is satisfactory. But if the ports crack before the crank reaches dead centre, a little will have to be taken off the shoulder of the stop collar.

If the ports do not crack until after the crank has passed dead centre, the shoulder of the stop collar will have to be made up by soldering or screwing a thin section of metal to the appropriate edge, or, of course, a new stop collar could be made. I hope neither will be necessary!

Well, that completes the cylinders and motion and you can now give them an air test. Don't forget, though, that the inner side of the main steam way will need a ¼ in. × 40 t. plug fitting, the front side being used for attaching the lubricator and main steam pipe.

● *To be continued*

ZOE . . .

Continued from page 710

ashpan, as the pony truck comes very close to it, and would foul anything standing out when running over a line that was out of lateral alignment.

The British climate plays havoc with small railways just as it tries to do with their full-size relations, and as the small fry obviously don't get the same regular attention as the big ones, they are usually far from emulating the levelness of a billiard table.

I keep mine somewhere near the mark by putting then strips of wood between warped longitudinals and sleepers, as and where needed, but if I knew as much then as I do now I should have erected the line with light steel girders instead of wood longitudinals. Roy Donaldson should have no cross-winding trouble with his longitudinals made from scrap boiler tubes!

Don't erect the boiler permanently yet, as the pipework can be fitted and connected more easily while the boiler is still detachable. This is the next job.

● *To be continued*

ALLCHIN ME TRACTION ENGINE

Continued from page 701

The back and front covers, shown in Fig. 22, are identical except that the front one has the slot for the key. Cut these from 24-gauge brass, a little oversize, and drill the two No 65 holes at the sides in the back cover, and that corresponding to the key-hole.

Cut out the lock body (Fig. 23) from 16-gauge brass, and the lock bolt (Fig. 24) from 16-gauge bright mild steel. These will need some nice fitting to ensure that the one slides smoothly in the other. The 1/32 in. wide slot in the bolt is best cut with a slitting cutter in the lathe—doesn't matter if it has a square end instead of the round one shown. Do not open out the lower jaw of the bolt fully at this stage.

Clip the body and backplate together in correct relative positions, and jig-drill the No 65 holes through the body. Push two 21-gauge pins through both components to keep them correctly placed. Now with the bolt in the closed position, the location of the central pin can be marked off from the slot in the bolt, and drilled No 65. Jig-drill the front cover from the back one.

Making the lock work

Back cover and body may now be sweated together, with the three pins in place. Check the bolt in place to see that it slides nicely.

File up the key (Fig. 25) from a scrap of mild or rustless steel. Now the jaw of the bolt can be opened out gradually until the key will rotate properly, at the same time sliding the bolt back and forth.

The bolt will need to be eased in thickness, which can be done by rubbing both sides on emerycloth. With the front cover in place, it should move reasonably easily, but not too freely when the key is turned.

File up the hasp (Fig. 26) from rustless steel, and fit it properly Apply a spot of grease to the bolt—preferably graphited—and the front cover may be fitted, the pins being lightly riveted over.

In the concluding article of the Allchin ME model traction engine, which will appear shortly, the author will deal mainly with the technique of painting and lining out the finished engine.

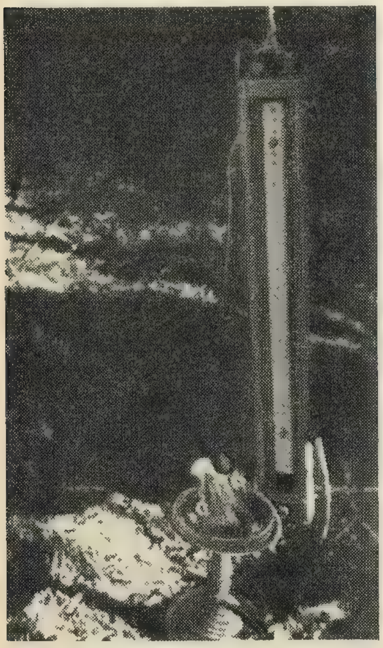
An experiment with natural gas

By Methanides

It is fairly common knowledge that an inflammable gas (methane, s.g. 0.555 and c.v. approximately 950 b.t.u. per cu. ft) is given off by decaying vegetation, and this article describes how a small but useful quantity of the gas was collected from a stagnant pond.

The apparatus was very simple, consisting of an old five-gallon oil drum, cut down one side and halfway along the top and bottom edges (Fig. 1). The sides were then opened out flat and set at an angle of about 15 deg. to the centre line, and the cut halves of the top and bottom also were opened out. A short piece of $\frac{3}{8}$ in. copper pipe was soldered to the drum for fitting a gas tap (Fig. 2).

Next a wooden framework was fixed to the oil drum (bound with wire) and the opened-out sides were nailed to the wood (Fig. 3). This crude raft and hood comprised my gas collector. The contraption when placed in water floated with the tops of the wood just above the surface.

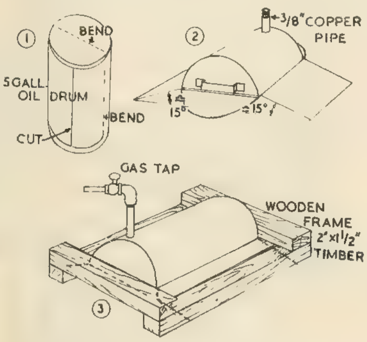


The gas ring (burning methane) with manometer in the background

The next requirement was a stagnant pond. An extremely foul one was selected in a wood; it was surrounded by bushes and overhanging trees and was quite deep. In addition, the bottom was covered with dead leaves, twigs and small branches to a depth of several inches.

When the bed was prodded with a stick, a profusion of bubbles rose to the surface, indicating that the decaying rubbish lying on the bottom was giving off plenty of gas.

With the gas tap opened the raft was pushed down into the water, and the air was forced out of the oil drum. The tap was then closed and the vital part of the operation began.



The gas collector apparatus

The bed of the pond directly below the raft was prodded and stirred with the stick, and within two minutes gas filled the drum. The raft was thereupon floated to the side of the pond and weighted with stones; these caused it to sink low in the water. A rubber tube was then attached to the gas tap and led to a tee, which, in turn, led to a manometer and a gas ring. (The gas ring was of the needle-valve type for adjusting the size of the jet.)

The tap was turned on and the gas ring lit, but until the needle valve was adjusted the gas burned fiercely and at times the flames blew off. When the air holes were opened the flame was dark blue—invisible in the bright sunlight—but it was very hot. With the air ports closed the flame was a dull yellow.

The author prodding the pond bed

With the needle valve set very fine and the gas pressure regulated to 4 in. w.g. a steady and quiet flame was achieved at the burner. The gas burned for just under two minutes before the collector was emptied.

With the same needle setting the gas ring was afterwards tried on town gas, but it refused to burn—backfiring immediately. This indicated that the gas from the pond had a higher c.v. than town gas, necessitating a smaller jet orifice and a higher pressure to force the gas through the small opening.

The collector held about 2½ gallons, or 0.4 of a cubic foot, and the area covered was about 3½ square feet.

It was assumed that half of the gas was lost due to bubbles bursting outside the collector. Accordingly 0.8 of a cubic foot of gas must have been liberated from 3½ square feet. Therefore, if no gas was wasted, one could expect to be able to collect one cubic foot of gas from a little over four square feet of pond bed.

There must, of course, be a limit to the amount of gas that can be obtained from any one pond, but it is significant that after a week the pond was sufficiently replenished for the experiment to be repeated.

Now possibly some process could be devised whereby the decomposition of dead leaves, etc., could be speeded up under more controlled conditions and thus provide an ample supply of methane for domestic use.

This would be particularly suitable in country districts where there are plenty of dead leaves and vegetation. ■

KEEP IT CLEAN!

Another aid to better locomotive performance

By Eric Hawkesworth

COALING and ash disposal in miniature steam locomotives raise problems akin to those experienced on full-size engines. Suitable fuel should be readily accessible in the tender, and the replenishment of coal must be carried out quickly and cleanly. Coal, of course, has to be burned efficiently, which means keeping fire bars free of ash and clinker—and, afterwards, ash and unburnt coal from a let-down fire should be capable of speedy ejection from the firebox.

My solutions to these problems, as applied to a 1½ in. scale passenger-hauling engine, are all achieved by modification to the original design as built.

FITTED TENDER COAL HOPPER

All too often one sees the tenders of exhibition-finish engines piled high with stuff that resembles nutty slack, which, if the locomotive is a copy of a British Railways prototype, is certainly true to form. It seems a pity to spend hours painting a tender to show standard then ruin the finish by a few moments of live-steam running.

A fitted coal box, removable seat and foot rests enable me to convert my tender from working to show model in a minute (Fig. 1).

At each filling of hand-picked anthracite, the coal box is taken from the tender to the coal bag and the dust is knocked out before re-coaling. The box is shaped to fit invisibly within the high-sided tender and is made of $\frac{3}{16}$ in. plywood tacked and glued together.

A driving seat fits behind the coal box and has a sponge-rubber cushion, and foot pedals are stubs of 1 in. dia. bar—mild steel—turned down for threading one end and for rubber spigots the other. Two ½ in. holes in the tender frames locate the rests.

After four years' busy use the tender is still in its original paintwork. The use of such a fitted coal holder to engines of any scale is certainly recommended.

ASH-GUARD ARRANGEMENT

Fig. 2 shows the ash-guard fitment that was devised to replace the conventional ash-pan/damper after the experience of the first season's running.

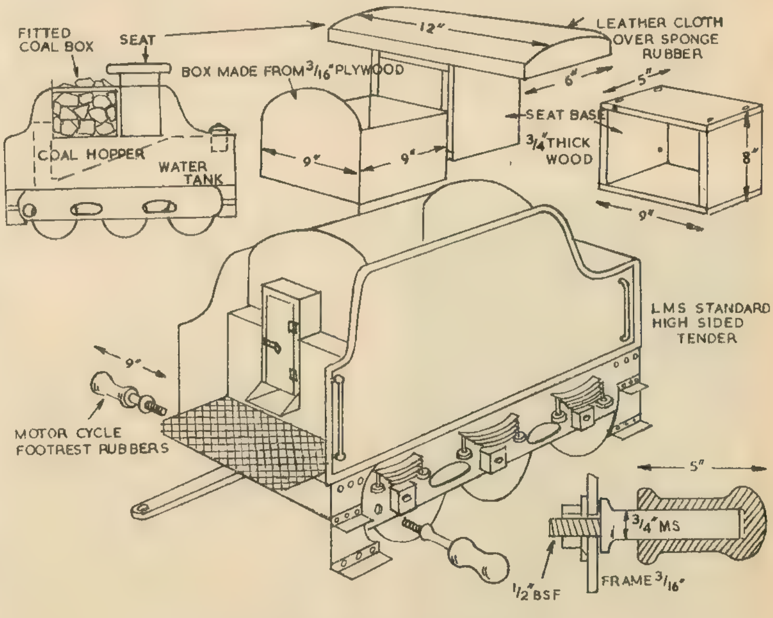


Fig. 1: The fitted seat and coal box

Many hours were spent in building the original true-to-scale pan—always a difficult task with 4-6-0 narrow firebox type locomotives—but it was ruthlessly ripped out on the first strip-down. The sheet metal guard was constructed as a temporary measure—and has stayed in place ever since !

The axlebox/horn-covers are cut from a single piece then bent and riveted to be a tight fit over the horns. The axle tunnel is bent over a piece of suitable diameter bar and is riveted to the horn guards via small bent-up lugs. To protect the brake pull-rod and, in particular, the rear knuckle-joint with its brake-hanger cross arm, a V-shaped metal extension is riveted to the forward face of the axle tunnel.

Ash from the 50/50 air-bar area firegrate falls freely to the ground and is not trapped between the frames. With this arrangement, eight hours' continuous steaming, hauling one-ton loads at five minute intervals, is possible. At the end of such a day the fire is still bright and clean and —using good grade anthracite—there is surprisingly little ash on the track.

Absence of damper doors is not noticed; control of heat is maintained solely by a steam jet when standing. Turning the blower off puts the fire out.

My ash guard will be replaced this winter by one of similar design in brass.

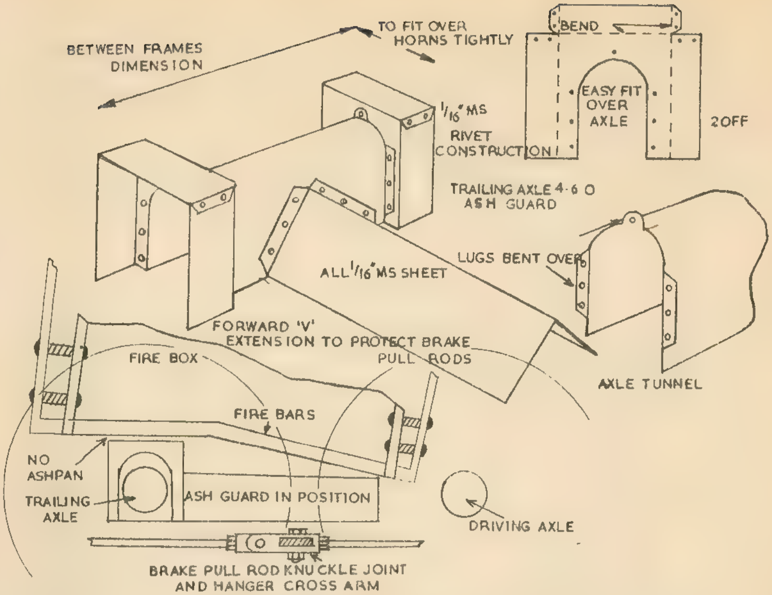
CLEANING THE FIREBOX

Specially designed ash-collection pans (Fig. 3) make the job of cleaning out the old fire bearable. One pan fits in the cab and has a forward projecting lip which hooks into the fire-hole door opening, and ash is raked on to the short-handled shovel and deposited in this cab pan.

The second collecting tray fits between the rails immediately beneath the firebox. The tray is dropped in place and the engine is run over it. Both pans are of $\frac{1}{16}$ in. steel sheet with the corners bent and riveted. Two handles are turned up from 5 in. lengths of $\frac{5}{16}$ in. dia. bar threaded $\frac{1}{4}$ in. BSF at each end. These are bent into semi-circles and nutted through the quarter holes in the ends of the track pan.

Pokers of varied lengths soon clean the fire bars, and the bars (which are in two halves) can be quickly fished back through the fire door for inspection. The engine is rolled off the track pan, and the cleaning out is finished.

Only firing tools required while in steam are the short-handled shovel and a prodding poker. No trouble is experienced by having the forward coal division fixed permanently in place in the tender and, with the cab roof off, all the controls are easily accessible, and the short-handled shovel manages the long fire very well.



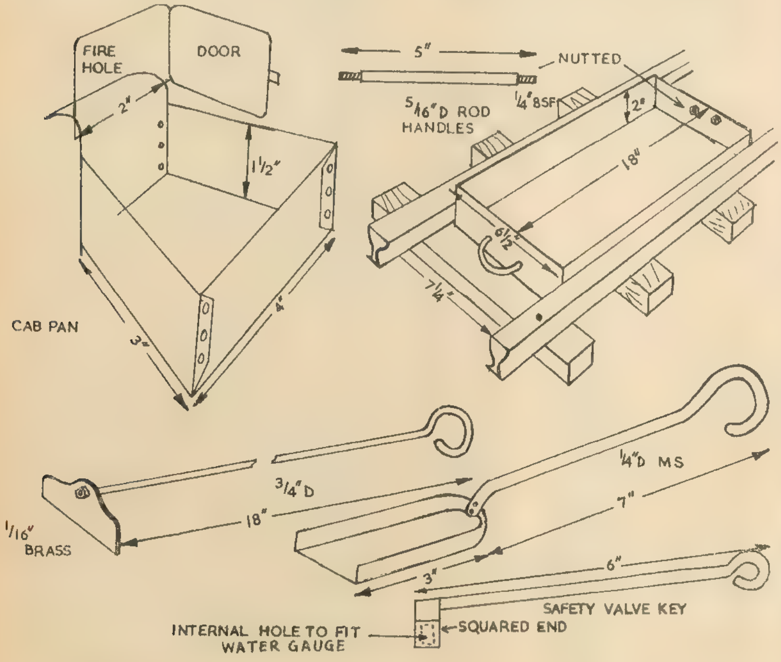
Above, Fig. 2: The ash-guard arrangement for an anthracite-burning engine

Below, Fig. 3: Some necessary cleaning tools and components

Cleaning operations are performed with the tender connected to engine—indeed, the two are seldom parted except for winter storage and overhaul.

Included in Fig. 3 is a most useful dual-purpose tool that always hangs in the cab. It is a key with a squared end to fit the safety valves. An internal hole within the squared end fits over the water-gauge shut off taps and is extremely useful when a gauge glass blows.

Much of the thrill of model locomotive running comes from improving —or trying to improve !—on last year's performance. Anything that helps to secure more power and more efficiency is worth a try. It is not always by blindly following theoretically-correct notions that the best results are achieved either ! ■



SUBSCRIPTION RATES

We very much regret that, owing to the increased postal charges, the subscription rates of *Model Engineer* have been raised from 58s. 6d. to 65s. (USA and Canada from \$8.50 to \$9.25) post free. Individual copies by post now cost 1s. 4d.

ZOE

This week LBSC describes the boiler fittings, grate and ashpan for the $1\frac{3}{4}$ in. gauge passenger-hauling 2-8-2 locomotive

Continued from 31 October 1957, pages 612 to 614

SETTING out the footplate fittings on a locomotive the size of *Zoe* is rather a nightmare. On the one hand the fittings themselves must be of reasonable proportions to enable them to do the job efficiently, while on the other the available space is so restricted that it is a job to set them out so that they are readily accessible and, at the same time, avoid that "stuck-on-anyhow" appearance. I try to strike a happy medium, and the illustration shows how this can be done in the present case.

A combined steam turret or fountain is mounted on the top of the boiler directly over the regulator handle and is made high enough to keep the handle of the whistle-valve clear of it. The steam-gauge syphon is connected to the left-hand union on the turret, and the pipe leading to the blower valve is connected to the right-hand union. A separate elbow with union is screwed into the top of the boiler immediately ahead of the turret, and a pipe attached to this goes down to the injector steam valve, which can be attached to the side of the wrapper at any convenient point lower down.

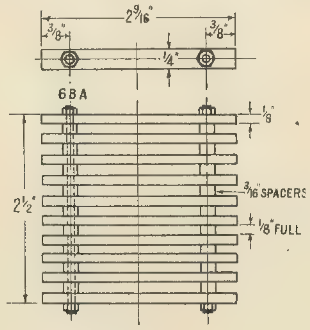
The upper fitting of the water gauge is screwed into a saddled socket to the left of the turret. This enables a glass to be fitted which is long enough to indicate the full water range, and it can be set vertically.

The clackbox for the emergency feed from the handpump in the tender is screwed into the backhead close to the right-hand side. This leaves plenty of room for the fire-hole door to open wide. The bypass valve is not attached to the backhead, and the handle projects up through the footplate clear of the other fittings.

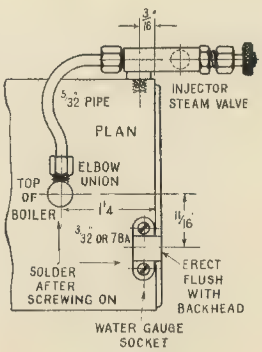
TURRET AND WHISTLE VALVE

Use good quality bronze or gunmetal rod, or best quality brass rod, for all your fittings. To make the turret, part off a 1 in. length of $\frac{5}{16}$ in. rod, chuck in the three-jaw, centre, drill through with a No 43 drill, open out and bottom to $\frac{7}{16}$ in. depth with a $\frac{3}{16}$ in. drill and D-bit, slightly countersink the end and tap 7/32 in. × 40. Reverse in the chuck and repeat the process but only open out to $\frac{3}{8}$ in. depth, and the D-bit need not be used. Then put a 3/32 in. parallel reamer through the remains of the No 43 hole.

At $\frac{1}{4}$ in. from the D-bitted end, drill a 5/32 in. hole right across, followed by another at right-angles to it. At $\frac{1}{4}$ in. from the other end, drill a similar hole in line with the left-hand one. In the ends of the cross-hole, fit $\frac{1}{4}$ in. × 40 union nipples, and in the one at right angles fit a stem turned from $\frac{3}{8}$ in. hexagon rod to the dimensions shown and drilled 3/32 in. In the hole at the other end fit a 7/32 in. × 40 union nipple and silver solder the lot at one heating. Pickle, wash and clean up.



GRATE



BOILER FITTING DETAILS

For cleaning these small fittings at greased-lightning speed I use a 4 in. circular wire brush mounted on a short spindle with the end turned taper. The end of the spindle of my tool grinder is drilled and taper-reamed to suit. Three short lengths of steel rod with the ends screwed to suit the threads in the fittings are kept close handy.

It is the work of barely a minute to push the brush spindle into the taper hole, screw the fitting on the end of a rod, switch on the grinder and hold the fitting against the revolving brush, turning it about so that all parts are polished. As the grinder turns at 2,990 r.p.m. and the brush is of fine wire, the result is what the LBSCR cleaner boys called a bobby-dazzle. A warning: keep your fingers clear of the brush.

Seat a $\frac{1}{8}$ in. rustless ball on the D-bitted end of the reamed hole and make a cap from $\frac{3}{8}$ in. hexagon rod as shown, drilling it No 30 to take a spring wound up from bronze or hard brass wire of about 26 gauge, to keep the ball in place when there is no steam in the boiler.

The cap on the other end can be made from $\frac{5}{16}$ in. square rod, or hexagon rod with two opposite corners filed off to leave an oblong head. Drill it No 51 and cut a slot a full $\frac{1}{16}$ in. wide across it to take a lever made from $\frac{1}{8}$ in. rod. Turn the grip first, then flatten the rest with a hammer, and finish with a file. To pin the lever in the slot I use the headed end of a domestic blanket pin, drilling the holes with a No 56 drill.

The push rod is made from $\frac{1}{16}$ in. bronze, brass or rustless steel wire, and should be just long enough to push the ball off the seating when the lever is pressed right home—a trial-and-error job. Drill a 5/32 in. hole on top of the boiler as close to the backhead as possible, so that the hole goes through the backhead flange. Tap it $\frac{3}{16}$ in. × 40 and screw in the turret with a taste of plumber's jointing on the threads.

THE WATER GAUGE

There is no need to detail out the the water gauge, as it is made to the instructions given for *Rose* in the issue for October 10, the only difference being that the union for the blowdown pipe is set at the angle shown in the arrangement of fittings. This is necessary to clear the firehole door.

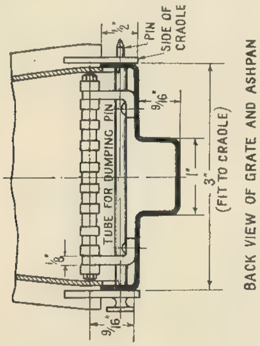
The socket can be a casting, in which case the shape will be as shown, with a chucking piece to hold it for facing off and drilling and tapping the boss. All the seating will need is rubbing on a piece of emerycloth

laid on the boiler barrel. It can then be fitted to the top of the wrapper, with the face of the boss flush with the backhead (see plan view) and the hole in the curved seating exactly over a similar hole drilled in the boiler to suit. Fix it with two 3/32 in. brass screws and sweat over the flange and screws with solder just like the stay nuts.

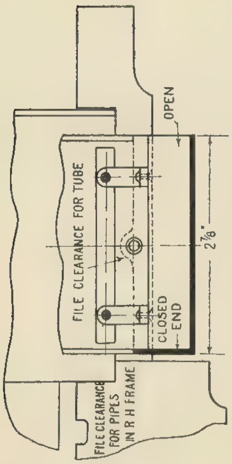
The socket can also be sawn and filed from a $\frac{3}{4}$ in. length of $\frac{3}{8}$ in. $\times$ $\frac{7}{16}$ in. brass rod. The curved seating can be formed in the way I described for making brake blocks, soldering the rod to a piece of brass plate and bolting it to the faceplate at $1\frac{1}{2}$ in. from the lathe centres. A boring-tool set crosswise in the rest will soon form the curve. It can also be fly-cut, as described for saddling chimneys and domes. Milling-machine owners can do the job in minutes by holding the rod in a machine vice on the table, and running it up to a 3 in. cutter on the arbor.

Mark the outline of the socket on the piece of rod, centre pop the boss, and chuck in the four-jaw with the pop mark running truly. Drill 5/32 in. for $\frac{5}{16}$ in. depth, tap $\frac{3}{16}$ in. $\times$ 40, slightly countersink, face off, and turn $\frac{1}{16}$ in. length to $\frac{5}{16}$ in. dia., which will leave the correct width for the flange. Saw and file to outline, drill the steam way and screw-holes in the flange, and erect as described for the casting version.

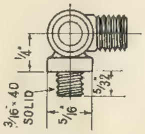
On the backhead, at $1\frac{7}{16}$ in. below the centre of the tapped hole in the socket and exactly underneath it, drill a 5/32 in. hole and tap it $\frac{3}{16}$ in. $\times$ 40. Screw the lower fitting of the water gauge into this, and line up the two sections and fit the glass exactly as described for *Rose*.

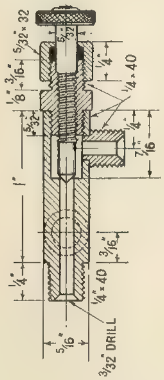


BACK VIEW OF GRATE AND ASHPAN

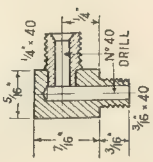


SECTION OF GRATE AND ASHPAN

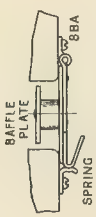




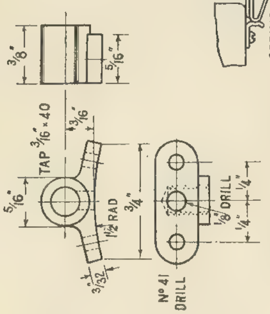
INJECTOR STEAM VALVE



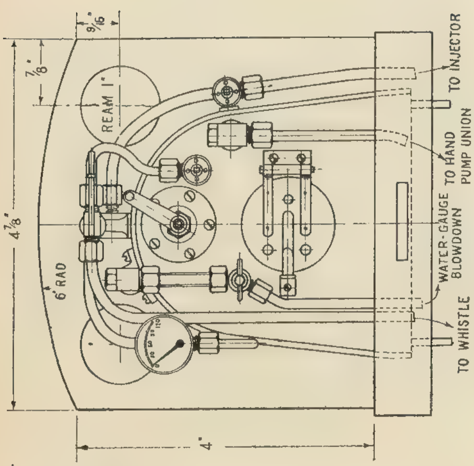
ELBOW UNION



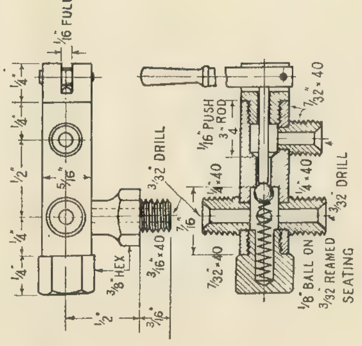
PLAN OF FIREHOLE DOOR



WATER GAUGE SOCKET



ARRANGEMENT OF FITTINGS



TURRET AND WHISTLE VALVE

INJECTOR STEAM VALVE

Chuck a piece of $\frac{5}{16}$ in. rod, face the end, centre deeply, turn $\frac{1}{4}$ in. length to $\frac{1}{4}$ in. dia. and screw $\frac{1}{4}$ in. $\times$ 40. Part off at 1 in. from the shoulder. Reverse in the chuck, centre, drill right through with a 3/32 in. drill, open out and bottom to $\frac{7}{16}$ in. depth with a 7/32 in. drill and D-bit, tap the end $\frac{1}{4}$ in. $\times$ 40 and slightly countersink it. At $\frac{1}{4}$ in. from the end, drill a 5/32 in. hole and fit a $\frac{1}{4}$ in. $\times$ 40 union nipple in it.

At the other end, $\frac{3}{16}$ in. from the shoulder and at right angles to the nipple, drill a similar hole. Chuck the $\frac{5}{16}$ in. rod again and turn 5/32 in. length to $\frac{3}{16}$ in. dia., screwing $\frac{3}{16}$ in. $\times$ 40. Part off at 5/32 in. from the

shoulder, reverse and re-chuck in a tapped bush, and turn 3/32 in. length to a tight fit in the hole. Squeeze it in, and silver solder both joints.

Chuck a piece of $\frac{5}{16}$ in. hexagon rod, face, centre, drill No 30 for a full $\frac{1}{2}$ in. depth, turn down $\frac{3}{16}$ in. length to $\frac{1}{4}$ in. dia. and screw $\frac{1}{4}$ in. × 40. Part off at a bare $\frac{1}{2}$ in. from the end, reverse and re-chuck in a tapped bush, turn 5/32 in. length to $\frac{1}{4}$ in. dia. and screw $\frac{1}{4}$ in. × 40. Reverse in the bush, put a 5/32 in. × 32 tap through, and open out for $\frac{1}{8}$ in. depth with a No 21 drill. Make a gland nut from $\frac{5}{16}$ in. hexagon rod to suit.

For the pin, chuck a $1\frac{1}{4}$ in. length of 5/32 in. rustless steel or drawn bronze rod, turn a blunt cone point on the end, screw 5/32 in. × 32 for a bare $\frac{3}{8}$ in. length, turn away the threads for $\frac{3}{16}$ in. from the point, file a square at the other end and fit a hand wheel about $\frac{5}{8}$ in. dia. Assemble as shown in the section.

Drill a 5/32 in. hole in the wrapper about halfway down the backhead and close enough to the edge to go through the flange of the backhead. Tap $\frac{3}{16}$ in. × 40 and screw in the solid spigot of the valve, which should be parallel with the centre line of the boiler when screwed up tightly (see plan view).

Chuck the $\frac{5}{16}$ in. rod again, centre and drill to $\frac{1}{2}$ in. depth with a No 40 drill. Turn $\frac{3}{16}$ in. length to $\frac{3}{16}$ in. dia. and screw $\frac{3}{16}$ in. × 40. Part off at $\frac{7}{16}$ in. from the shoulder, drill a 5/32 in. hole in the side at $\frac{3}{16}$ in. from the end, fit a $\frac{1}{4}$ in. × 40 union nipple in it and silver solder it.

On top of the boiler at $1\frac{1}{4}$ in. from the backhead drill a 5/32 in. hole, tap $\frac{3}{16}$ in. × 40, screw in the elbow, the union of which should point right when tight, and solder it as well. Connect the union to the screwed end of the injector steam valve by a 5/32 in. pipe with union nuts and cones, as shown in the plan view.

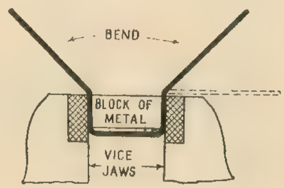
REMAINING FITTINGS

Make three clackboxes or check valves as shown for *Rose* in the October 10 issue, but screw the spigots 7/32 in. × 40 instead of $\frac{3}{16}$ in. Two of these are screwed into the tapped bushes at the front end of the boiler barrel. The third is screwed into a hole drilled and tapped to suit, close to the right-hand side of the backhead about halfway down (see arrangement of the fittings).

The steam gauge should be $\frac{7}{8}$ in. dia. reading to 120 lb. and is attached to the left-hand union on the turret by an inverted swan neck of $\frac{1}{8}$ in. copper tube with union nut and cone. The right-hand union is connected to the union on the blower valve by a similarly-furnished $\frac{1}{8}$ in. pipe.

I always get the exact length of pipe by bending a piece of wire first and trying it in place. When straightened out, it gives the length of pipe needed, and you don't waste any, an advantage in these days of inflated prices. Incidentally, in pre-war days I always shopped over the counter and bought more than I needed—like women at the sales—but it has paid dividends, for I have enough stock to see me through !

The safety valves are the same as those for *Rose*, but when turning the outside of the columns, leave a lip at the top to simulate the outline of the full-size Ross valves, just for appearance' sake. The dome cover, which is a casting, can be turned and



HOW ASHPAN IS BENT

finished exactly as described for *Rose*, and is attached to the boiler by a 3/32 in. countersunk screw in the tapped hole in the plug on top of the inner dome.

If a casting isn't available for the firehole door, cut a circle of 18-gauge steel $1\frac{1}{4}$ in. dia. and another $\frac{7}{8}$ in. dia. Rivet them together with a $\frac{1}{8}$ in. spacer about $\frac{5}{8}$ in. dia. between. Fit a miniature edition of the smokebox door hinges to the larger plate but with a single long lug between, as shown in the view of fittings, and attach it to the backhead by two 8 BA brass screws.

The end of the handle is bent as illustrated, and a spring catch, made from thin bronze or hard brass strip, is screwed to the backhead, to keep the door closed when the engine is standing. The blast will look after that part of the business when the engine is running with a load, and will probably take the coal off the shovel !

THE GRATE

If cast grates are available I recommend their use, as they last much longer than if made up with cut bars; but if built up, ten $2\frac{3}{16}$ in. lengths of $\frac{1}{8}$ in. × $\frac{1}{4}$ in. black mild steel strip will be required. Drill a No 34 hole at $\frac{3}{8}$ in. from each end of one of them and use it as a jig to drill the rest. The spacers are slices of $\frac{3}{16}$ in. steel rod a full $\frac{1}{8}$ in. thick.

Drill No 34 before parting off. The bearers are $2\frac{3}{8}$ in. lengths of 7/64 in. steel rod screwed 6 BA at each end and nutted. When assembling, fit a bracket at each end of the first space as shown, instead of a round spacer. These brackets are bent up from the same material as used for the bars, the holes in the feet being No 40.

Similar brackets should be fitted at each end of the first spaces in a cast grate, but as they cannot be riveted, and there are no bearers, put the bracket in position, drill No 44 through bar and bracket, tap 6 BA and put a screw in.

THE ASHPAN

The ashpan is bent up from a piece of 18 or 20-gauge steel $2\frac{7}{8}$ in. wide and approximately $5\frac{1}{4}$ in. long. Scribe lines across the narrower dimension at $\frac{3}{8}$ in., 1 in. and $\frac{3}{16}$ in. from each edge and bend to the hopper shape shown in the back view. My Diacro bending brake does this kind of job in minutes—dead to size—but the work can be done in the bench vice when a machine isn't available.

Bend the hopper part first, then drop a piece of 1 in. × $\frac{1}{2}$ in. bar in it and grip the lot in the bench vice with the marked lines showing above the jaws. Bend each side outwards and down until at right angles to the hopper part—then all that remains is to bend up the $\frac{1}{2}$ in. bit at each end, and there is your ashpan. The front end is closed by a piece of the same material cut to shape and brazed in; the back is left open.

Push the ashpan up in place with the boiler temporarily in position, the firebox sitting in the gap in the cradle as shown. Drill a No 30 hole at each side, right in the middle and under the gap, through the side of the cradle and the ashpan as well. Remove the ashpan, open out the holes to $\frac{3}{16}$ in. and fit a 3 in. length of $\frac{3}{16}$ in. tube (steel for preference, but copper or brass will do at a pinch) with the hole through it large enough to take a $\frac{1}{8}$ in. pin.

Braze or silver solder the tube in place and file the ends flush, then countersink them to help the pin to enter easily. The pin itself is merely a $3\frac{1}{2}$ in. length of $\frac{1}{8}$ in. steel, rounded off at one end, and furnished with a screwed-on knob or nut at the other.

Stand the grate assembly on the steps of the ashpan in the position shown, mark off the location of the rivet holes, drill them No 40, countersink them underneath, and rivet up with 3/32 in. iron rivets. Alternatively, use 3/32 in. or 7 BA countersunk screws, put in from the underside either into tapped holes in the feet of the brackets or put through clearing holes and nutted on top of the feet. There must not be any projections below the steps of the

Continued on page 704

Do not forget the query coupon on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

Safety precautions

Can you advise me on the safety precautions to be observed when using an oxy-acetylene welding outfit? (I have in mind the possibility of blowback to the gas cylinders.) Also is there any risk in using cylinders which have been standing a very long time, and is there attendant risk in using cylinders which are nearly empty?

In addition to the standard B.O. oxy-acetylene torch I also have a torch using acetylene and atmospheric pressure air (Bunsen principle). Are there any special precautions for employing the latter?—S.P.B., Helston, Cornwall.

▲ *There will be no danger of blowback to the gas cylinders if the correct equipment is employed and the makers' directions observed.*

As to using cylinders which have been standing a very long time, it would be advisable to send these back to the supply company for their inspection and report as they may have deteriorated; the regulations in this respect are very strict.

Cylinders which are nearly empty: there will be no danger so long as the specified pressure can be shown on the gauge, but if there is insufficient pressure to attain this with the regulator valve wide open, they should be regarded as empty.

In the case of a torch using acetylene gas and atmospheric pressure air on the Bunsen principle, there should be no possibility of blowback with this type.

O gauge Newbury

I would much like to build the 4-4-0 steam locomotive *Newbury*, but am wondering whether it would be practicable in O gauge (all my track is in this gauge). If so, can you advise me by what amount the dimensions should be reduced, and also the appropriate sizes of wheels and cylinders?—R.R.A., Didcot, Berks.

▲ *The locomotive* NEWBURY *could be built for O gauge, the working parts being scaled down in the ratio 7 : 10. However, certain parts might have to be kept at their original thickness, e.g. frames; these should still be $\frac{1}{16}$ in. thick.*

Driving axles should be $\frac{3}{16}$ in. dia., bogie 5/32 in. and tender $\frac{3}{16}$ in. The cylinders should be about $\frac{3}{8}$ in. bore × $\frac{7}{16}$ in. or $\frac{1}{2}$ in. stroke.

The boiler should be made of the thinnest possible seamless copper tube, the water tubes should be kept at 5/32 in. o.d. minimum, reducing their number to two only if essential.

The only real snag may be the question of obtaining cylinder castings in this size. If you are able to make wood patterns, W. H. Haselgrove, of 1 Queensway, Petts Wood, Kent, or Messrs Reeves, of Birmingham, would probably be willing to cast them. Wheel castings for O gauge could be obtained from Bond's o' Euston Road, Reeves, Stuart Turner, or Kennion Brothers.

As an alternative a similar design for O gauge is the 4-4-0 BAT *by LBSC. Drawings are obtainable from the Percival Marshall Plans Service.*

HDML model

Having served for several years on 72 ft HDMLs, I am interested in building a complete scale model to, say, 1 in. to 1 ft.

Would it be feasible to build this model as the original, double-diagonal planked? Though a builder of several simple ship models I have never attempted one of this class.—C.L.K., Southampton.

▲ *Drawings of the 71 ft 6 in. Mk VI MTB built by the British Power Boat Co. Ltd at Southampton are given in the Percival Marshall book "Model Boat Construction" by Harvey A. Adam (also drawings of the American MTB PT620), and detail drawings, with full building instructions for a diagonally-planked hull, are included.*

Diagonal planking is quite feasible for a model and examples have been seen at Model Engineer Exhibitions.

Plans for Amethyst

Can you please advise me where I can get good, detailed plans for a frigate model of HMS *Amethyst*? I was wondering whether Mr Norman A. Ough had produced one.—E. W., Birmingham.

▲ *Norman A. Ough may be able to help you with plans for HMS* AMETHYST *although he has not so far advertised plans for this ship. His address is 98 Charing Cross Road, London, WC2.*

A good model of this ship was made some years ago by MODEL ENGINEER *and presented to the Duke of Edinburgh at an ME Exhibition. Mr. A. D. Trollope, of the Imperial War Museum, who supervised this model, may also be able to help you with the plans.*

Aqualung cylinders

I would like to know whether it is possible to obtain small compressed air or oxygen cylinders to be made into aqualungs for underwater swimming.—G.A.O., Oldham, Lancs.

▲ *There are quite a number of cylinders of various kinds available on the surplus market, but in the interests of safety fully-tested cylinders should be obtained from specialist firms who are prepared to guarantee their safety.*

Joining the RLS

I would very much like to join the Road Locomotive Society. Can you give me any information, please?—W.M.P., Truro.

▲ *You should apply to the secretary of the Road Locomotive Society, Mr B. A. Stoyel, 38 Lancing Road, Orpington, Kent, who will supply you with all details.*

Making a rheostat

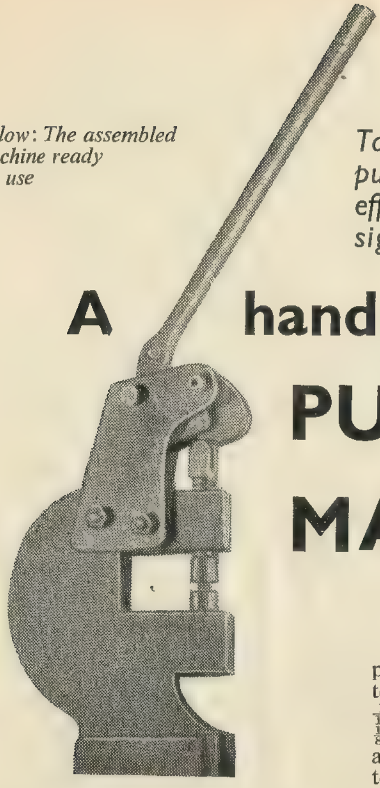
I have a transformer 240 v. to 15 v. a.c., 50 cycles and a copper-oxide rectifier 12 v. 4 amp. d.c. which I want to use in conjunction with a controller and reversing switch for operating a Hornby-Dublo train. Could you give me the particulars of the rheostat and other equipment required for this controller?—R.S., Sydney, NSW.

▲ *The transformer and rectifier described should be quite satisfactory for running Hornby-Dublo locomotives, and should be capable of running at least three trains together.*

A suitable rheostat and reversing switch combined is available from Meccano Ltd. If you wish to make this item, the simplest way is to use a "radio" type double-pole double-throw switch for the reversing and to wind the rheostat on a slate or tile former using 28 s.w.g. Eureka resistance wire.

The best way of finding the length of wire required is to try out one locomotive and lengthen the resistance wire in the circuit until the locomotive is reduced in speed to a dead crawl (while running "light").

Below: The assembled machine ready for use



Take the tediousness out of punching with this simple, efficient little machine designed by DENNIS HORLER

A handy PUNCHING MACHINE

PUNCHING holes in sheet metal with a wad punch and hammer can be a laborious job especially if a great number of holes is involved.

A sheet metal job was encountered some time ago that necessitated punching a number of $\frac{1}{16}$ in. dia. holes spaced $\frac{1}{2}$ in. apart around the edge of the plates. After marking out and punching some thirty by hand an aching arm prompted research into methods, should such a job occur again.

The punch shown here is the outcome. The materials used are easily obtainable and can mostly be acquired from scrap dealers. The machining can be carried out on a $3\frac{1}{2}$ in. lathe, the only requirement outside the average model engineer's capacity is the welding, but any garage could manage the few straightforward welds.

The principle behind all punches is the exertion of a great pressure through a short distance by virtue of a lesser pressure through a much longer distance. In this machine the effort is applied from the handle, which is in effect a lever of the first order, through a linkage which serves as a transmission medium to a cam.

The cam, due to its profile, applies the now magnified effort to the plunger. The lever action allows it to punch clean holes up to $\frac{3}{16}$ in. in $\frac{1}{16}$ in. tinplate and up to $\frac{1}{4}$ in. in $\frac{1}{8}$ in. aluminium. For thicker work an extension is needed on the handle to increase leverage.

THE COMPONENTS

A piece of mild steel or iron is required at least 1 in. thick; if it so happens that the only material available is thicker so much the better. This should be cut to shape as shown in Fig. 1. Get the local dealer to cut this with the blowtorch and if possible persuade him to rough grind also.

Since this has to be machined, first file up the bottom and side edges flat and square thereby making a register for cross slide drilling. After filing to a reasonable finish on all edges the material is set up on the cross slide and, making sure of alignment with the centres, a long reach pilot hole of about $\frac{3}{16}$ in. dia. is put through.

Next, all gib strips are tightened to prevent chatter and possible drag, and the hole is opened up in stages by increasing drill sizes to 15/32 in. A $\frac{1}{2}$ in. reamer is put through, care being taken to supply plenty of cutting oil and to see that feed back lash is always taken up.

While on the cross slide the hole is opened up to $\frac{5}{8}$ in. for a depth of $\frac{1}{2}$ in. to form a seating for the coil return spring. The purpose of the spring is merely to return the plunger to its upper position after punching, and any bit of spring will serve the purpose.

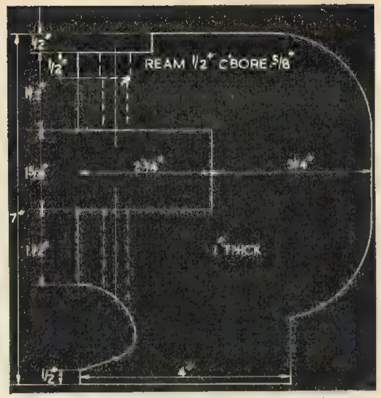


Fig. 1: The body of the machine

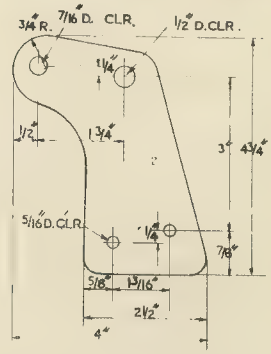


Fig. 2: The bearing plates

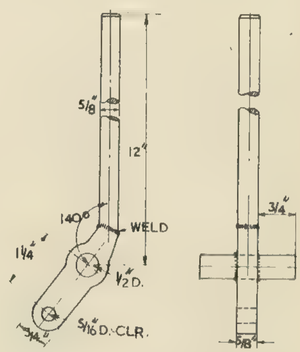


Fig. 3: The lever and link plate

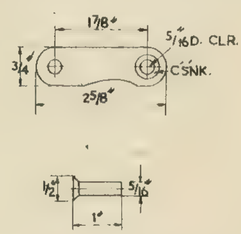


Fig. 4: The link and pin

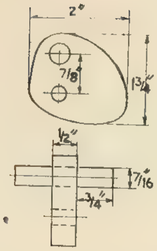


Fig. 5: The profile and assembly of the cam

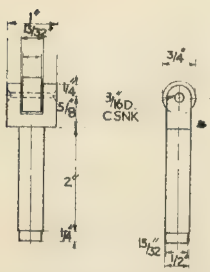


Fig. 6: The plunger and roller

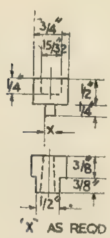


Fig. 7: The punch and die

Two bearing plates are cut from $\frac{5}{16}$ in. thick m.s. to the dimensions given in Fig. 2. The best method, perhaps, is to rough-cut first then clamp together and finish the edges of both with file or grinder.

With the plates still clamped the holes are drilled, thus ensuring that the holes are correctly spaced and the mechanism thus square with the side plates. One of the plates should now be laid on the main body so that the axis of the $\frac{7}{16}$ in. dia. hole is in alignment with the vertical axis of the $\frac{1}{2}$ in. reamed hole. While in this position the $\frac{5}{16}$ in. bolt holes are marked out.

The lever mechanism is shaped and welded together (Fig. 3). The lower part of the lever is a short length of flat mild steel filed to the shape shown. The handle of the lever is a piece of $\frac{5}{8}$ in. dia. round mild steel 12 in. long welded to the former at an angle of 140 deg.

After welding the holes $\frac{7}{16}$ in. and $\frac{1}{2}$ in. clear are drilled, thus preventing any distortion that may result if welded after drilling. A short length of $\frac{1}{2}$ in. dia. m.s. round is welded in position projecting $\frac{3}{4}$ in. each side to form the pivot.

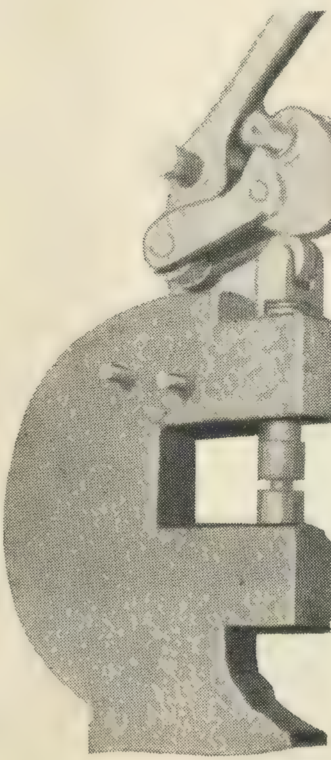
Two link plates are required $2\frac{5}{8}$ in. long, $\frac{3}{4}$ in. wide and $\frac{3}{16}$ in. thick. Link and pin are drilled and filed up to shape as in Fig. 4. They are then pinned to pivot freely on the lever assembly. The other end is pinned in a similar manner to the cam, the ends of the pin being filed flush with the edge thus avoiding any projections.

THE CAM

The profile of the cam was originally plotted on an enlarged scale in order to give as smooth a curve as possible and yet obtain the movement required. This was then reduced to the required size. Fig. 5 gives the exact profile and size of the cam. This is cut out of $\frac{1}{2}$ in. mild steel and filed up to shape, care being taken to ensure a square edge so that the point of contact between cam and roller will exist over the whole cam width.

The two holes are drilled and the short shaft is welded in position. It is a good plan to use $\frac{5}{8}$ in. bar for the shaft and turn down to $\frac{1}{2}$ in. and surface the sides of the cam at the same setting. The complete assembly of the machine can be seen from the picture.

The bearing plates are bolted to the main body with $\frac{5}{16}$ in. $\times$ 2 in. bolts. The coil return spring should be a free fit on the plunger rod and of sufficient stiffness to return the plunger to the raised position.



The bearing plate removed to show action of the mechanism

PLUNGER ROD AND ROLLER

The mechanism is completed by the plunger rod and roller. The rod is turned from 1 in. $\times$ $\frac{1}{2}$ in. mild steel, part of its length being reduced to $\frac{1}{2}$ in. dia. This is turned to a good sliding fit in the $\frac{1}{2}$ in. reamed hole of the main body. The operation should be carefully carried out because a sloppy fit would impair the efficiency of the machine.

The upper portion of the rod, Fig. 6, is slotted to receive the roller and shaft. This slot can either be milled out or a hole drilled and the edges connected with hacksaw cuts, the whole being cleaned up with a file. The roller is turned from mild steel to the dimensions shown and case-hardened or, alternatively, a roller from an old chain could be adapted for such an application.

The roller shaft is a length of mild steel with a countersunk head one end, the other side being riveted over flush with the edge.

PUNCH TOOLS

The punches and dies were turned from cast tool steel generally to the drawings in Fig. 7. It is most important that the edge of the punch is turned square and after the edge is relieved about two or three degrees to form a slight taper. The die is similarly relieved by turning to a slight taper which enables easy ejection of the punchings.

A recess 15/32 in. dia. is turned on the punch to form a push fit on the plunger rod, thus ensuring accurate location. Again the shoulder on the die should be such that it fits the hole in the punch body without slop.

The material used in this case did not require hardening for the punch, but for the die it was hardened and tempered at dark straw colour in oil. Cropping tools and doming punches could also be made and used in this tool, and a set of punches would be an asset in every workshop. ■

RECONDITIONING A MACHINE HACKSAW

This is the third article of this short series. In it EXACTUS discusses the countershaft

THE countershaft (Fig. 13) is connected to the motor by a Picador V-belt. The whole assembly is positioned just rear of the halfway mark of the saw bed, bringing it clear from falling swarf.

The shaft runs in two Picador bearings mounted on an angle-iron frame. This is suspended from the saw bed by four lugs forming a hinge, which allows the frame to move and adjust the belts. Slots provided in the base of the motor for the belt adjustment combine to give a large measure of adjustment. Fig. 14 shows all the parts that comprise the countershaft unit.

The frame was made from a piece of 1 in. × 1 in. × $\frac{1}{8}$ in. angle iron cut to the dimensions in Fig. 15 and bent to shape. The two ends that butted together were brazed and each corner which had a saw cut was given the same treatment. When the frame had cooled it was cleaned up with a file and the holes for the bearings drilled.

To do this I placed the shaft through the two bearings and put them on the frame. Then I lined the shaft up with the top edge of the frame and clamped the bearings. Using the bearings as a drill jig I drilled through them into the frame with a 21/64 in. drill. Holes for the hinge lugs and belt tensioner were also drilled.

Two pieces of 1 in. × $\frac{1}{2}$ in. bright mild steel were cut $1\frac{1}{2}$ in. long for the frame part of the hinge and a $\frac{3}{8}$ in. dia. turned and screwed $\frac{3}{8}$ in. BSF $\frac{1}{2}$ in. long. This is a straightforward machining job.

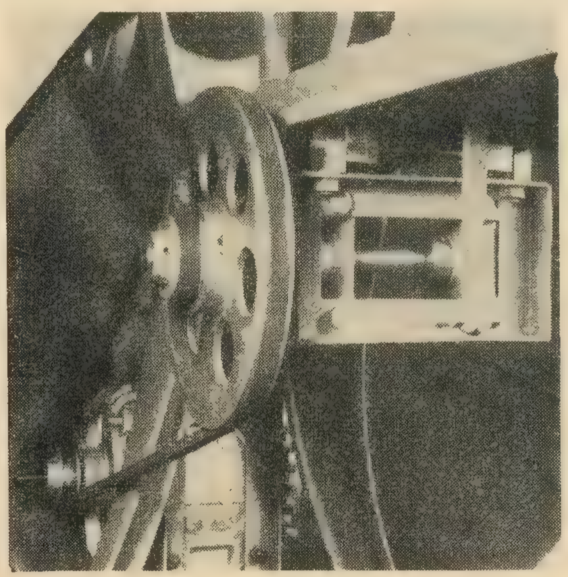
To bring the $\frac{3}{8}$ in. dia. as central as possible I set the bar so that the tool just touched each corner as the chuck was rotated by hand. Fig. 16 shows the piece of bar in the four-jaw with the diameter nearly finished. Two square columns, to complete the hinge, were cut from a piece 1 in. square bright mild steel. They were set up in the four-jaw, as in the previous operation, and a $\frac{7}{16}$ in. dia. turned 1 in. long and threaded $\frac{7}{16}$ in. BSF, leaving $\frac{3}{8}$ in. of plain between the thread and the shoulder.

A piece of $\frac{3}{8}$ in. dia. silver steel was used for the hinge pin and the holes in the lugs drilled with a letter U drill and reamed $\frac{3}{8}$ in. to take the pin. Then a hole was drilled and tapped $\frac{1}{4}$ in. Whit. in the end of one of the square columns to take an Allen grubscrew. A dimple was made in the hinge pin with the point of a drill to correspond with this hole so that when the grubscrew was screwed home the pin would be unable to work itself out.

To prevent the countershaft from running out of its bearings two collars were made to the dimensions given in Fig. 15. Bright mild steel, $1\frac{3}{8}$ in. dia., was used with a $\frac{5}{8}$ in. dia. hole reamed in the centre and parted off to finish $\frac{9}{16}$ in. thick.

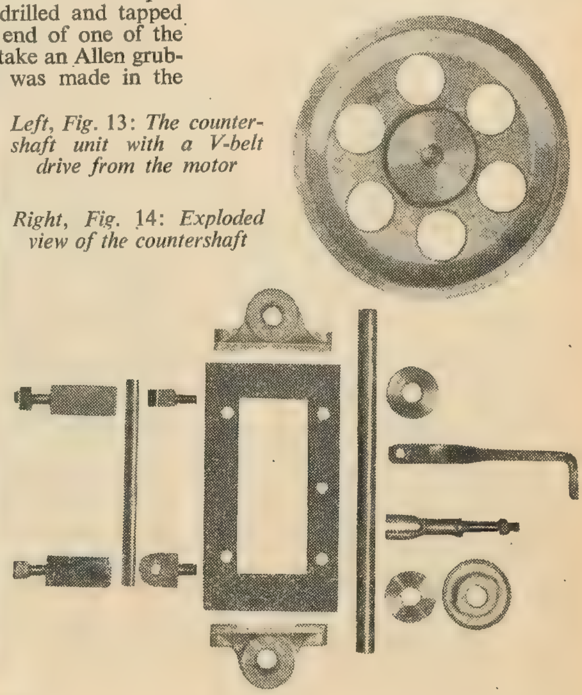
A hole was drilled and tapped $\frac{1}{4}$ in. Whit. central with the end faces to take an Allen grubscrew. These collars were positioned on the shaft each side of the Picador bearing furthest from the pulley end, and the shaft was dimpled as before in the hinge pin to locate the grubscrew. The inner collar can be clearly seen in Fig. 13.

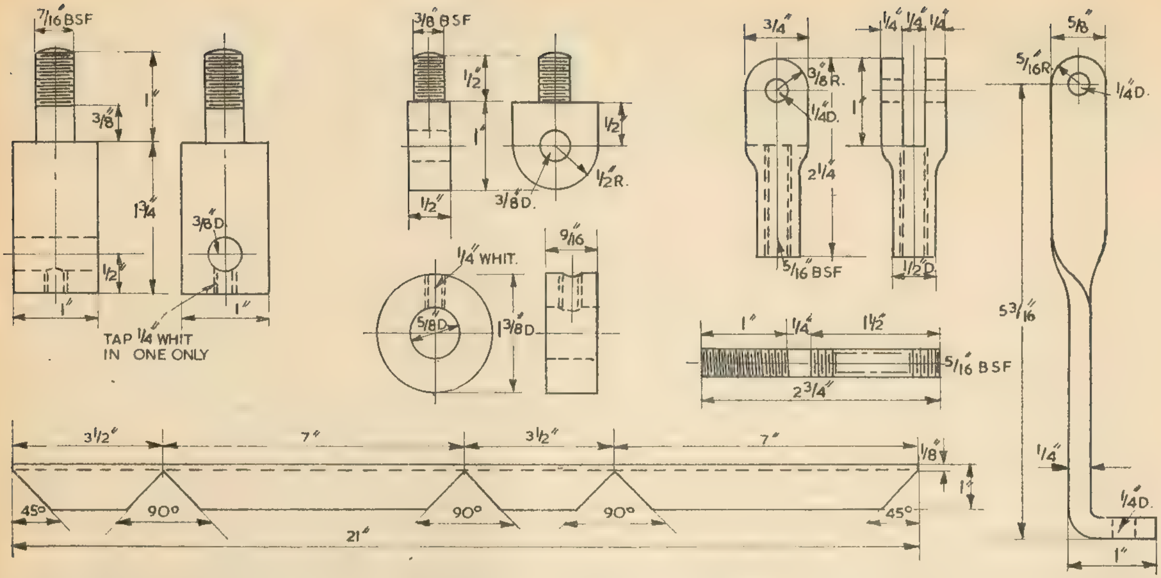
To be able to adjust the belts and hold the frame rigid when in use a bracket was made from a piece of $\frac{1}{4}$ in. × $\frac{5}{8}$ in. bright mild steel to the shape and size given in Fig. 15. It



Left, Fig. 13: *The countershaft unit with a V-belt drive from the motor*

Right, Fig. 14: *Exploded view of the countershaft*





was secured to the saw bed by a $\frac{1}{4}$ in. Whit. bolt, the fork end being an item of government surplus. I have a box full of such odds and ends and this fork end was just the job.

I tapped it out $\frac{5}{16}$ in. BSF and made a stay from a piece of $\frac{5}{16}$ in. bright mild steel to suit. It is screwed tight into the fork and passes through a clearing hole in the frame and locked by a nut on either side when the belt is correctly adjusted.

All my Picador pulley wheels were bored for a $\frac{5}{8}$ in. shaft so that with three of them I was able to fit them straight on to their shafts. The fourth had to be bored out.

The outside face of the rim of the pulley was already machined and this helped immensely as I was able to clamp this face direct to the faceplate.

To set the pulley for running concentrically I placed a $\frac{5}{8}$ in. dowel in the existing bore and got it running true with the aid of a test-dial indicator. When all was true I started to bore out the hole to $\frac{7}{8}$ in.

Not having plug gauges to check the bore for size during the boring operation I used the combination of inside callipers and micrometer. The illustration in Fig. 18 shows the callipers being checked by the micrometer after the former had already checked the diameter of the bore.

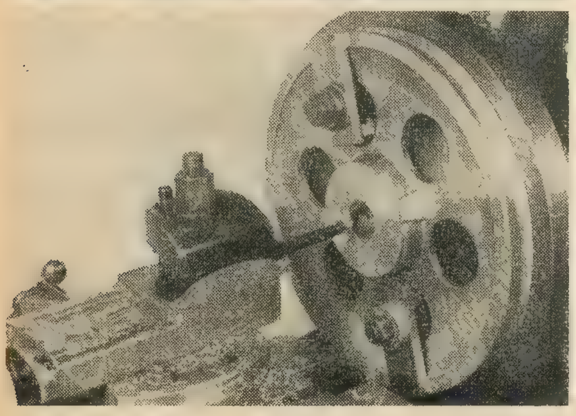
Working to close limits can be achieved by this method. Efficiency improves with experience; the more one uses callipers the more one acquires the " feel " or " touch." ■

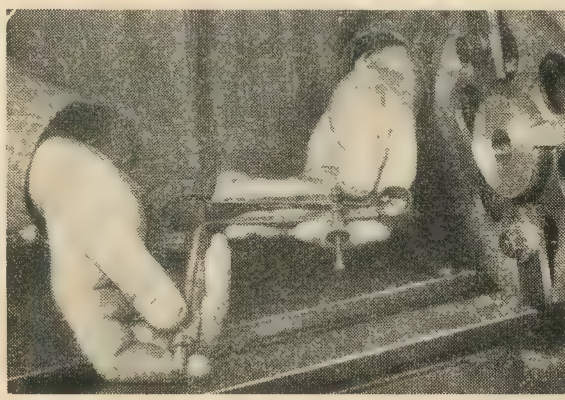
Above, Fig. 15: *The countershaft details*

Left, Fig. 16: *Machining a $\frac{3}{8}$ in. dia. on the frame hinge*

Below, left, Fig. 17: *Clamping the pulley to the faceplate*

Below, Fig. 18: *Using the callipers and micrometer*





POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

BUILDING A BOILER

SIR,—I have just noticed the query from G.B., Southampton [October 10], with regard to marine power plant.

While I agree with your technician on the fact that there are easier boilers to make for the novice, I would like to point out that to my mind there are factors to be considered before embarking on boiler making.

(1) It is better to make the boiler you fancy. Some prefer coal firing to petrol or spirit burners and the boiler in question is not a bad one to make in comparison to the Scotch return-tube type, or locomotive type boilers, owing to its simplicity.

(2) The maker need not be very expert to make this boiler, but some idea of metalwork is a very great asset. The main thing is: can the would-be builder silver solder the boiler? If he is proficient at this then the battle is half over.

An 18-year-old ME reader in New Zealand wrote to me for information, and now he informes me that his boiler is finished and is very satisfactory. His present problem is a set of castings for the engine.

Keighley, Yorks. C. MAUDE.

TRIBUTE TO LBSC

SIR,—I could not agree more with "Grateful" [Postbag, September 26].

I was a boy at school when I started to take MODEL ENGINEER and the LBSC series on *Fayette* was running. Since that day I applied myself to engineering and it is my considered opinion that LBSC has done more to encourage would-be engineers and model makers than anyone else.

I am at present a chief production engineer, and when I look over the efforts of some alleged draughtsmen and engineers I can only wish they had just a bit of the applied knowledge and initiative of LBSC.

Bedhampton, Hants. N. LOCKWOOD.

STAINLESS STEEL

SIR,—Stainless steel is first class for boilermaking, and the boiler should last more than a lifetime.

It is very tough, but not really hard, and will screw and turn lovely. A lubricant should be used for screwing and tapping with a slow speed and plenty of lubrication for drilling (it will burn out a high speed drill if not tackled properly).

For sawing, use high-speed blades; low tungsten blades are not suitable for the first couple of strokes takes the set off the blade.

Plate bending and forming will be hard going as the metal tends to be very springy, almost like tempered steel. I do not know of any annealing process.

Brazing is almost as easy as brazing copper or brass, but care must be taken not to heat the metal more than required. Stainless steel welding rod and suitable flux can be obtained from most British Oxygen Company branches.

The gas welding process is similar to brazing. The plates to be welded are not actually melted and fused; the rod is melted and runs, as with brazing rod.

Stainless steel can also be electrically welded, with suitable electrodes.

Marston Green, Birmingham. R. L. ROBERTS.

TASMANIAN ENGINES

SIR,—A good friend of ours, Ralph Howe, of Mole Creek, Tasmania, has three traction engines, all of which are in excellent working order. They are an Aveling and Porter compound roller No 11978, a Buffalo Pitts Co. single traction No 8426, and a Marshall and Sons single traction No 42963.

The Tasmanian Public Works Department still use traction engines on some of their crushing plats.

The Launceston City Council, as well as having a compound Aveling and Porter roller No 10754, are still working a single Aveling and Porter roller No 1930 which is over 70 years old.

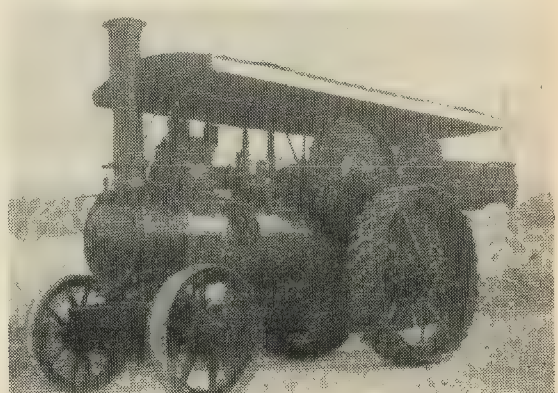
Tasmania, Australia. R. PROCTOR, P. BRABON.

BOILER TESTING

SIR,—The letter from F. W. Barker ["Sole Survivor," October 10] appears to contain one or possibly two misstatements. For example, Fowlers Works should surely read Fowell and Co., St Ives, Hunts. This firm and its successors have carried out repairs for Wirksworth Quarries for some years.

During a visit to the works in October 1954 I saw one of their Robey tandem steam rollers in for overhauling. It was a PVDC compound fitted with non-ferrous connecting rods with marine-type big-ends, and steel-bushed eccentric rods of similar material. Its number was A/L2773.

I also find the statements in paragraph four difficult to believe. To give a ploughing engine in its 45th year a hydraulic test to 250 p.s.i., and then to follow it up with a steam test to 300 p.s.i. appears to me to be an unjustifiable risk.



This Marshall engine is one of three road locomotives operated by Ralph Howe, of Mole Creek, Tasmania. See the letter from Messrs R. Proctor and P. Brabon on this page

The boiler of a ploughing engine is one of the most severely stressed boilers of any type of locomotive, for not only is it subjected to the internal stresses due to steam pressure, and the external stresses set up by the reciprocating mechanism of the engine, but it has in addition to withstand the severe local stresses imposed by the ploughing mechanism.

I can only assume that neither Mr Barker nor his inspector has ever seen a ploughing engine burst its boiler. I saw the remains of a Fowler ploughing engine after the boiler explosion at Catley Park, Linton, Cambs, in 1904, when to the best of my recollection the driver was the sole survivor. The watercart man was killed. The whole section of the barrel between the backplate stay brackets and the smokebox tubeplate stay brackets was fragmented. The smokebox end of the barrel was severed at about the 23rd longitudinal seam rivet from the smokebox tube plate. Both the longitudinal lap jointed seams were intact.

The accident very forcibly impressed upon me the strains and stresses to which ploughing engine boilers are subjected, and although the more modern engines may have been strengthened, there is always the question of age and fatigue, which should not be forgotten.

I feel I am qualified to write on this subject, as I was for many years responsible for the development, testing, and trials of apparatus subjected to pressures many times greater than those mentioned in the letter, and although I have been a reader of ME since 1899, this is the first time I have read of the test pressure being intentionally exceeded by steam pressure, which might have serious consequences, even with a small model boiler.

Lee-on-Solent, Hants. — W. F. Thain.

MINIATURE TRAMWAY

Sir,—Readers who are tramway enthusiasts will no doubt be interested in a miniature tramway at Eastbourne.

Miniature railways, of course, are to be seen in many places, but this tramway would appear to be unique. It runs from Princes Park gates to the Crumbles and is claimed to be the smallest tramway using double-deck cars.

The track consists of light plate-bottom rails laid on wooden sleepers to a gauge of 2 ft, current being supplied to the cars by overhead trolley wire.

When I saw the line in operation at the end of August two types of car were being used, and it will be seen from the photographs that one was an open type car with a central entrance while the other was a miniature double-decker the size of which can be seen by comparing its height with that of the onlookers.

Both types of vehicle are carried on double bogies, the trucks being of the maximum traction type with unequal size wheels, each truck having one motor driving the larger pair of wheels.

The control equipment consists of a small drum controller of usual pattern giving series-parallel control. It was made by Messrs Dick Kerr.

On the side of the wooden building, shown in the photograph of the open type car, is an interesting collection of photographs of tramcars used in various English provincial towns, though most of these cars have been replaced by buses.

Ralph H. Dormer.

Two types of tramcar which are in use on the miniature tramway which runs between Princes Park and the Crumbles, Eastbourne

GEAR EXPERIMENTS

Sir,—Mr Westbury in his comments on the General Engineering Section of the recent Exhibition (ME, September 12, page 360] refers to my model horizontal engine. As he surmises, this was made for experimental purposes, primarily to demonstrate the fact that Greenly's valve gear, far from being the "wash-out that can't be linked up" (as has for so long been consistently alleged in certain quarters), is, when properly designed, erected and adjusted, a first-class gear, which will give a consistently accurate steam distribution either in fore or back gear right up to mid-gear.

If some people are incapable of attaining such results the fault most emphatically is theirs and *not* the gear's. The gear is one which must conform strictly to certain simple

POSTBAG . . .

geometrical principles; if these are met the results are excellent.

Mr Westbury refers to the engine as being jet condensing; actually it is surface condensing (the condenser has yet to be made).

The Edwards type air pump is not suitable for a jet condenser, and so far as I know is never used in such connection. Jet-condensing air pumps are usually double acting and submerged, as they have to deal not only with the condensate, but with the cooling water as well.

I was delighted to read Mr Westbury's support for experimental work in general; there is far too little of it in model steam engineering work today and there is a huge field available to any model engineer who has the audacity to do a little independent thinking for himself.

Regarding Mr Westbury's suggestion for an engine to be suitable for testing out various different valve gears, this is an idea that I have often toyed with, but with many years' practical experience of a wide variety of valve gears behind me, I am doubtful if the game (apart, of course, from the sheer enjoyment to be derived) is worth while.

Given an engine with a well-designed cylinder, with ample ports *and passages* and a long-lap long-travel valve, I am fairly certain that, if a series of well designed valve gears were successively applied to it, there would probably not be 5 per cent difference between the results obtained from the best and the worst.

As a matter of fact, a set of skeleton models, all for the same dimensioned valves and ports, made to a unit scale would be of the greatest interest. They should be made to turn by hand, preferably to a fairly large scale, and on each an index should be provided on the crankshaft or crosshead so that the exact point in the stroke at which the various events took place could be accurately checked.

Rustington, W. Sussex. K. N. HARRIS.

SCALE THROTTLE

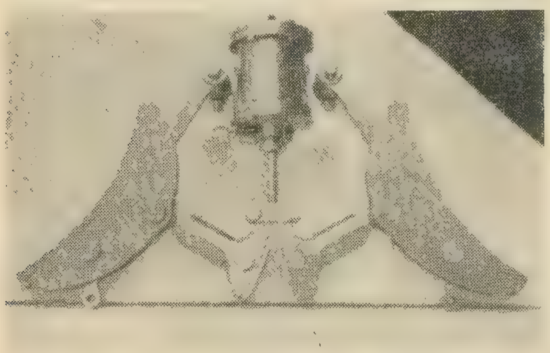
SIR,—My ¾ in. scale throttle is an exact copy of American multiple cradle type.

It is made of monel metal. The radius of the quadrant is 11/16 in., the crank radius is 15/32 in. (shown in the picture as it is viewed from fireman's side).

It is mounted on the back boiler head and a long rod connects the link and sliding piston, thence runs along the side of the boiler to the front end.

The quadrant teeth are spaced 0.031 in. apart and 0.021 in. deep.

The cam brakes will be used for Victor Marks' 1½ in. scale 4-4-0 diamond stacker. Made of monel metal and cold rolled, the cylinders are 13/16 in. dia. × 13/16 in. stroke. Brake shoe radius is 3½ in.



The model of the American multiple cradle type throttle (below) and the cam brake designed by Jack M. Fesco, of Los Angeles, Calif.

When the piston moves upward the cams push the brake shoes outward, thus applying the brake.

Los Angeles, California. JACK M. FESCO.

LOCAL LINES

SIR,—While wishing the Railway and Steam Locomotive Preservation Society success in its effotts to preserve historic steam locomotives and possibly a line to run them on, I question the wisdom of their policy of advocating steam power on British Railways since I think it will do more harm than good.

The Railway Development Association, of which I am Midland Area Archivist, has for some time been advising, and in some cases appearing at inquiries on behalf of, local authorities faced with the loss of local lines. Our booklet dealing with the Isle of Wight inquiry is well known.

In nearly all cases the facts have proved the suitability of the diesel railcar or lightweight railbus as a means to make the lines self-supporting. We think we can justly claim some of the credit for persuading the BTC to experiment with the lightweight diesel railbus.

It must be remembered that although most railway enthusiasts, and possibly most readers of MODEL ENGINEER, are steam enthusiasts, the general public are not. The large increase in traffic on all lines where diesel railcars and electric trains have been introduced is an indication of the public's preference.

Unless we want to see the railways turned into super autobahns (and there are certain people who have prepared plans for and would like to see just that) we must see that the most attractive and modern methods of operation are used.

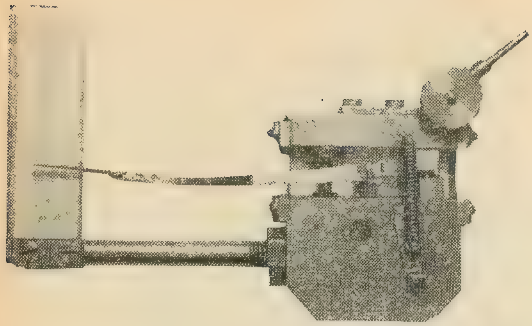
South Yardley, Birmingham. D. F. FELTON.

ANYWAY, IT GOES

SIR,—The dial gauge shown in my picture is more or less my own design. The idea originated, as far as I am aware, with the (British) NPL. They are, or were, doing it as part of a comparator, accurate to about one-millionth of an inch.

I am not that ambitious ! The scale divisions represent 0.01 mm., or 0.0004 in., and, of course, the thing is not used for real measurements, but for centring in the lathe. The magnification of about 60 times is quite enough for me in any case.

The apparatus has the feature of having no friction and no backlash, the moving parts being supported by flat springs, and the measuring unit also consisting of two flat springs,



Left: Dial gauge designed by T. Biegman and (right) his model of a wobble-plate steam engine

carrying on their connected ends the pointer. The divisions, calibrated by micrometer, are astonishingly linear. The snapshot is practically full size.

The other contraption is a Z-axle wobble-plate steam engine, made because it is a relatively simple engine. For instance, no castings are needed, there is only one valve, nearly all lathe work, including some milling. The rotating valve has its ports cut in the cylindrical surface, and this, in combination with the single action, has the result that all moving parts needing to be steam-tight are cylindrical and can be lapped.

When warm the engine can turn over at some 500 r.p.m. with about 3 or 4 p.s.i. Another advantage of the valve in this form is that it is enclosed in a manually rotatable bush, making it possible to influence the valve events during the run, including reversing.

The test bed is rather a makeshift job, and so is the boiler, only a pot-boiler in a casing. I don't like boiler making very much, but the things are unavoidable with a steam engine. However, it works very well. The brake consists of a piece of string wrapped one turn round a wooden pulley, the revolutions are measured stroboscopically (some word !) by neon bulb and white blob. Results so far: 2,000 r.p.m. 0.01 h.p. at ± 32 p.s.i.; accuracy not absolutely guaranteed.

Scheveningen, T. Biegman.
Nederland.

REMINISCENCES

Sir,—As an old Nor'-West fan dating back to the '90s, I found Mr Keiller's article of September 5 on the Webb compounds of great interest. His exposition of their failings was the clearest I have ever read, and I have read plenty during the last 40 years. How an engineer with Webb's reputation as a locomotive designer came to perpetrate bloomer after bloomer is almost beyond comprehension.

When I was a boy I lived at Willenhall, a small town three miles east of Wolverhampton, on what was originally the main line of the old Grand Junction Railway, later to become a constituent of the LNWR, and I saw many of the compounds: 4-4-0s, 0-8-0s both three-cylinder and four-cylinder, and 4-6-0 Bill Baileys.

I cannot, however, recall seeing a three-cylinder 2-2-2-0, but there were plenty of these to be seen on the excellent postcards sold at all LNWR stations at 2d. per packet of six. I treasured for years many of these, especially those showing *Jeanie Deans*, *Sunbeam*, *Marchioness of Stafford*, all 2-2-2-0s.

Leaving afternoon school at 4.30 p.m., there was always a race down to the railway side to "cop" the name of the engine on the "mail" which roared through the station at 4.40 p.m. with whistle shrieking as only a Webb whistle could shriek.

For what appeared to be weeks on end this train would be headed by the same 6 ft 3 in. Jumbo *Ostrich* No 632; at other times it would be double-headed with a Jumbo and a Problem, DX or Cauliflower, but I never remember a Jubilee on this train. A Jubilee could often be seen on the 7.30 p.m. down from Wolverhampton and one evening I spotted *Orion* No 1957 soon after it had been fitted with separate Joy gear to the h.p. cylinders.

Saturday mornings offered the best opportunities for copping namers, and we often cycled to Bushbury shed to see what was going on. It was there that we saw one of the early Precursors. Incidentally, although the Stafford Road Works of the GWR was only a very short distance from the Nor'-West shed, we were too fanatically Nor'-West to pay any attention to it.

In my later years I have had many regrets over this, as in the days to which I refer huge brass domes and outside cranks predominated on the GWR and the variety of engines was endless. In passing I might mention that the old broad-gauge track terminated only a matter of yards (at Oxley Viaduct) north of the Stafford Road works.

I cannot terminate these reminiscences without reference to the old men I knew as a boy who remembered the building of the old Grand Junction in 1837. Between us we have covered a period of 120 years.

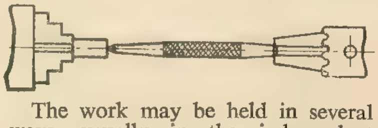
Newcastle upon Tyne, F. J. Lewitt.

CENTRE FINDER

Sir,—I notice J. Nixon described a centre finder recently [June 20]; well here is a design I constructed over 50 years ago while on a shooting trip in South Natal.

Obtain a good quality centre punch, somehow, not too short, say 3½ in. to 4 in. or make one from a worn out well-annealed round file.

Rest the blunt end firmly but lightly on the tips of the tailstock drill chuck, the sharp end being placed in the centre dot marked on the work which is required to run truly. Tighten up the tailstock sufficiently to prevent shake; if overdone the work gets jammed up the hollow mandrel and has to be bashed out with hammer.



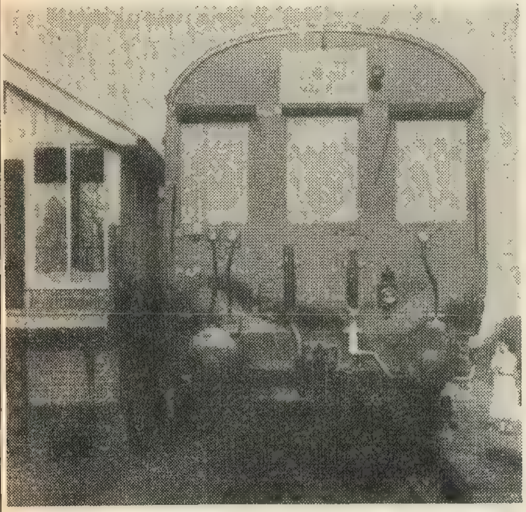
The work may be held in several ways, usually in the independent chuck or on the faceplate, depending on its character. Now the fun begins, the idea being to get the sharp end of the punch to run true, which means the dot also will run true. Jacking the work will be done by means of the key of the independent chuck, or if on faceplate by bashing with a hammer but it must run true at all costs.

A dial indicator may be used, which I do not recommend; it's a worrying instrument and it may take days or even weeks before one can stop the confounded needle from wobbling. Anyway, who worries over a thirty-second these days ?

Johannesburg. Geo. E. Perrem.

The LAST TRAIN to UTTOXETER

By W. Brammall



Above: The Stephenson Locomotive Society special leaving Salt Station and (left) the pause at Bromshall before returning to Stafford

THE special train run on the Stafford to Uttoxeter, the ex-GN line closed in 1951 after 90 years of service, aroused great interest among steam enthusiasts.

The run was arranged by the Stephenson Locomotive Society. Locomotive 41224 started on a well-kept length of track from Stafford, but as it joined the old Uttoxeter line the track became rusty, and bushes and grass growing in between the lines became increasingly abundant.

Through Stafford Common and Salt Station the train chugged carefully on before it stopped at Lugestne. Then on through Chartley and Stowe Station—once a railhead for pottery going to the Continent by train ferry wagons—to Grindley with its staggered platform, and through the 300 yd Bromshall Tunnel to Bromshall Junction.

After a short stay the train made its way back to Stafford, engine in the rear. ▣

Repair of an old lathe . . . *By W. D. Miller*

MY lathe is one of the old Drummond 4½ in. machines, which were carried in the mobile workshops of the 1914/18 war. The tailstock barrel is square threaded and the actuating hand wheel turns upon it like a nut to give lateral movement.

With long use the internal thread of the cast-iron hand wheel became stripped, and the repair presented novel difficulties. Replacement was out of the question for such an old and outdated machine, and I did not feel prepared to make a special hand wheel pattern and have a complete wheel casting to machine all over.

I, therefore, decided to bore out the wheel boss to clear the old threads and enlarge the hole sufficiently to accommodate a cast-iron bush to a moderate shrink fit. This bush was then bored out to the diameter of the root of the square thread on the steel barrel, which was in good condition, and preparations made for internal screw cutting.

The snag now presented was that the thread was a left-hand one and I shirked the process, which is rather hit and miss, of cutting a square thread from the blind inside end of the bush with the tool traversing outwards.

I found that by running the lathe in the reverse direction, that is away from the operator instead of towards him, and with the cutting tool facing towards the back of the machine, the operation could be seen, controlled, and gauged more easily than by the other method of cutting an internal thread, where the tool is facing the operator and the cut cannot be seen without craning over to the back of the lathe.

I must mention one word of warning. Be sure to have the chuck tight on the spindle nose of the lathe to withstand the effort of the cuts taken, or bang goes a perfectly good tool! ▣

The set of four sheets of drawings for *Myrmidon* can now be obtained on application to the Percival Marshall plans service. They are: Sheet I Hull Lines, Deck Plan, Hull Constructional Details and Deck Fittings, price 4s. 6d.; Sheet 2 Deck and Rigging Detail 4s. 6d.; Sheet 3 Standing Rigging 4s. 6d. Sheet 4 Running Rigging Details. When ordering please quote serial number SY 25.

CLUB NEWS

ME DIARY

November 22 Malden SME film show.
Thames Shiplovers and Ship Model Society, "Battle of the River Plate," Dudley Pope (the author), Baltic Exchange, London, 6.30 p.m.

November 23 Bristol SMEE Members' Exhibition Night: five cups will be awarded. Folk House, 7.30 p.m.
Institution of Engineering Designers visit to Associated Lead, Elswick, Newcastle upon Tyne, 10 a.m.

November 27 Birmingham SME visit to Johnson Matthey for welding lecture, 7.30 p.m.

November 28 Gauge 1 MRA, Gauge 1 track night of MRC, Hammersmith.
Hull SME Brains Trust.

November 30 West Riding SLS annual social, Guildford Hotel, Leeds, 3 p.m.

December 5 Eltham and District LS, "My 5 in. gauge Adams loco," A. Brock, Beehive Hotel, 8 p.m.
Huddersfield SME, "Philosophy of a Railway Enthusiast," W. Stocks, 7.30 p.m.

December 6 Thames Shiplovers club night, Oddi's Restaurant, Coptic Street, London, 7.0 p.m.
Rochdale SMEE "Boiler Making," J. Clegg, Lea Hall, 7.30 p.m.
Malden SME bits and pieces.

December 7 Gauge 1 MRA annual meeting, MRC, Hammersmith, London.
REC. Christmas film.
Bristol SMEE annual meeting, Folk House, 7.30 p.m.

Edited by THE CLUBMAN

ALL the fun of the fair awaited the 1,150 visitors to the exhibition held by Guildford Model Engineering Society at St Saviour's Hall. With three roundabouts, a showman's engine, a modern generating unit, a tractor and sideshows, the model fairground was full of life and movement.

So was the show. All day Eric Strudwick's steamplant continued to drive six other engines and to sound its whistle at intervals. There was also a stationmaster's whistle, heard for twelve hours and answered by Bill Pledger at the controls of Harry Taylor's 5 in. Halton tank.

Engines ranging from Singles to the 10,000 Class hauled the trains on the 4 mm. layout, and another special attraction was Stan Quantrill's harmonograph. Turning, milling and fitting were in progress at the workshop and members of Guildford Model Club were making aircraft. Models numbered well over a hundred and included some of small-scale collection.

President E. W. Gearey won the Tom Hodgkiss Competition with a launch full of radio-control mysteries. Others to whom Mrs Hodgkiss handed prizes were F. Love for his *Bantam Cock*, W. Pledger for his *Ethel* and Vic Selley was highly commended for his collection of 4 mm. road vehicles, some of which embodied details from local crashes. Somehow Mr Selley manages to build models as well as to take care of the society. The exhibition kept him so busy that during the week he clocked 300 miles on his Lambretta.

The society is grateful to James Walker and Company for the tables and crockery, to Vickers-Armstrongs and the Vickers-Armstrongs Model Club, to the judges and to all who provided models.

GLASGOW'S SHIPS

In Glasgow, where the model engineering exhibition is still being talked about, ship models are as popular as you would expect.

G. Nichol of the **Northern Model Power Boat Club** had two excellent models—of the royal yacht *Britannia* and the research ship *Magga Dan*—at the pondside event in Springburn Park where the **NMPBC** and the **Glasgow SME** run their boats.

Other craft included a Clyde puffer by Peter Ribbeck, treasurer and past president of the GSME; an Admiral's barge by Andrew Hall, the GSME secretary; a hydroplane modelled on Malcolm Campbell's *Bluebird* by T. Hamilton of the NMPBC; and sundry speed boats—hard chine hulls with diesel engines.

The final day of the Glasgow society's track season was a day of worries for Ernie Keay: two gauge glasses broken, a crack at the firehole ring of his newly-tinned boiler, and the discovery that he had 20 thou too much on the valves after converting from slide to piston !

The locomotive is now doing well again—like Tommy Adlington's 5 in. *Britannia*, which has had very little maintenance in the past three years.

A SUCCESSFUL SUMMER

"The sun smiled on the several visits to members' garden lines, and the steam fans were able to enjoy themselves."

In this sentence secretary J. T. van Riemsdijk (40 Bancroft Avenue, London, N2) sums up a successful summer for the **Gauge 1 Model Railway Association.** The association holds its annual meeting on December 7 at the headquarters of the Model Railway Club in Hammersmith, and the formal business, which opens at three o'clock, will be followed by running on the association's track.

But wait: there is something earlier. November 28 is a Gauge 1 Track Night of the Model Railway Club at the Hammersmith headquarters. No doubt the live steamers will provide the true railway atmosphere usual to such occasions.

Enthusiasts who would like to attend these meetings—they are all welcome—can get further particulars from the secretary.

BATH MC RESULTS

The meeting of the **Model Rail Car Association** announced for Boscombe on November 3 was postponed to November 17.

Here are the official results for the meeting held in October by the **City of Bath Mini-Car Club**:

Formula 1 (up to 1.5 c.c., 30 laps)
1 G. Todd (Bath), Cooper 1000, AM10: 2 min. 8.8 sec.
2 A. Stocker (Portsmouth), Alta, Mills 1.3

Formula 2 (up to 1.0 c.c., 30 laps)
1 G. Todd (Bath), Cooper 1000, AM10: 2 min. 12.2 sec.
2 A. E. Adams (Bournemouth), BRM, AM10

Formula 3 (up to 0.75 c.c., 30 laps)
1 A. Stocker (Portsmouth), Mercedes: no time recorded.
2 P. Bailey (Portsmouth), MG.TD

Formula 4 (up to 0.5 c.c., 15 laps)
1 S. Barrett (N London), MG.TF, Dart: 1 min. 20.2 sec.
2 M. Gandolphi (N London), TR2, Dart

Formula Libre (unrestricted to 1.5 c.c., 40 laps)
1 A. E. Adams (Bournemouth), Adams Spec., AM10: no time recorded.
2 W. Chandler (Portsmouth), Austin OHC, Elfin.

Challenge (not in programme) 20 laps
1 A. E. Adams (Bournemouth) Adams Spec., AM10.
2 G. Todd (Bath), Cooper 1000, AM10 (challenger).

Here are the principal markings in the first and second rounds of the national championships:

		Formula 1		
1	A. Stocker	Portsmouth	13	10 = 23
1	G. Todd	Bath	10	13 = 23
3	R. Rasbach	,,	0	7 = 7
		Formula 2		
1	A. E. Adams	Bournemouth	13	10 = 23
1	G. Todd	Bath	10	13 = 23
3	W. Chandler	Portsmouth	2	2 = 4
		Formula 3		
1	P. Bailey	Portsmouth	13	10 = 23
1	A. Stocker	,,	10	13 = 23
3	M. Pocock	Bath	10	2 = 12
		Formula 4		
1	S. Barrett	N London	13	13 = 26
2	G. Ward	,,	10	4 = 14
3	M. Gandolphi	,,	2	8 = 10

Maximum possible points in any formula: 26

⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ ⚓ *By JASON* ⚓ ⚓

A ship modeller's diary

A RECENT reference in these notes to the *Cutty Sark* has had some repercussions. A chief librarian in the Midlands, anxious to secure the book I mentioned on behalf of one of his readers, wrote to the Editor for further details.

He was supplied fully and Mr J. Clements, of Gravesend, the owner of the book *All About Ships* by Captain Chapman (1869), further gave the information that it was " printed and sold by Edward Colyer, Fenchurch Street, E.C."

But that is not all: Mr Clements whips one back. He has a model about a century old and he seeks information about it. As it is a neglected period among ship modellers, especially as to type, here are some details. It appears to be a builder's model at ¼ in. scale; name *Atlanta*, but no port of registry.

As it is well detailed around the decks the model should be of value to research workers. It represents a fiddle-bowed passenger paddle steamer. She is fitted with two masts, schooner-rigged, but no sails. There are two funnels, there is a narrow conning bridge between the paddle boxes and the masts have a heavy rake which was fashionable in the fifties of last century. A rough profile sketch shows a flush deck and square type counter. Finally there is a figurehead of *Atlanta*, complete with apple.

The prototype is 139 ft × 23 ft 6 in. × 15 ft; not very big as modern vessels go but these speedy cross-channel vessels were used as blockade-runners in the American Civil War. Mr Clements asks for help in identification and guidance in research work.

Poplar library

I HAVE always found this library of great help in Thames built and Thames owned vessels of the 19th century. The Thames of last century was a great shipbuilding centre and the local press recorded it with gusto. We start with many more details than are usual and the shipping press may be able to help the *Journal of Commerce* and *Lloyd's List* should be approached. *Lloyd's Register* should certainly be consulted. Incidentally *Lloyd's List* and *Lloyd's Register* are often confused with each other in the minds of many beginners. The former is a newspaper whereas the latter is an annual record of *currently* existing ships.

The local librarian will know where to find a list of blockade runners in the American Civil War. She might have been a real smart ship and perhaps a painting may exist. I know of no list detailing ships in paintings and etchings. Such a list would be extremely valuable to ship-lovers generally.

If the model has no connection with the Thames then the big shipbuilding centres should be tried. I'm afraid that our old friend the *Illustrated London News* does not go far enough back, i.e. to the middle of the century.

The fact that the builder's model does not show any port of registry probably means that the prospective buyers had not made up their minds on this. Even modern steamship lines register their vessels in one of several places. *Lloyd's Register* will give owner's name as well as port of registry. I'll be glad to pass on any information to the owner of the model.

Mayflower II

COMMANDER ALAN VILLIERS delivered a refreshingly breezy talk about *Mayflower II*. This was of great interest to many, as witness the packed Trident Hall by the National Maritime Museum.

Research workers were anxious to find out if any new details about *Mayflower I* were known. Modellers of the period sought an answer to such queries as: Did the rigging, both standing and running gear, function in practice as in theory ? Did the new plans which were altered to suit modern ideas, particularly heads and hats, have any effect upon the ship ?

Seamen, naturally, were interested in many other aspects of the voyage. Commander Villiers answered them all in his own inimitable manner.

The vessel had been designed, built and rigged without reference to him. The invitation to him to become master of the new untried vessel was accepted as a challenge. He " groused " in the manner of a sailor about the absence of a shakedown cruise in order to try out new gear and his crew. " Once around the bay " was deemed sufficient by the organisers.

He was well satisfied with his young crew. The extra height of the hull was countered with the addition of extra ballast by the new master. His orders were to sail the ship to Plymouth Rock, Mass, USA—and he did. The officers of the watch on many a liner, tramp and tanker must have rubbed their eyes when first viewing the strange vessel from several centuries ago. But one and all did the same thing: swung round to have a closer look, with a blast on the syren for good luck.

Villiers speaks well of the behaviour of the ship. The gear was adequate and suitable, the drabblers and the bonnets, those strange additional sails from other days, proved handier to handle than expected. But the dressing up and the speechifying at the other end was not to the master's liking; hence his early return home.

It is not without interest to relate that Ike Marsh, one of our leading modellers, was bosun of *Mayflower II*.

Wembley Exhibition

THE Ship Model Society were one only of over two score societies which helped in this event, yet the visitors numbered many thousands. The society put up an excellent show in competition models, models on loan, photographs and pictures, but above all in trophies.

Wembley are particularly proud of the Maltby Trophy which they have won for three years in succession. This award encourages members of ship model societies, or ship model sections, to send a large number of models to the ME Exhibition. The holder for the year is the society whose members have the largest number of points.

Room for expansion

THE Northern Association of Model Engineers hold their exhibition in Manchester every year at Easter. During my visit to Manchester in early December I hope to meet Mr P. Symon, the manager, and discuss the possibility of Southern and Northern Ship Modellers meeting each other and perhaps participating by exhibiting in each other's show. I think there is some room for expansion here on both sides.

Denford Small Tools (Brighouse) Ltd inform us that they are an independent company, not connected in any way with Denford Engineering Co Ltd, Halifax. Mr G. H. Denford is managing director of Denford Small Tools (Brighouse) Ltd.

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Grayson $3\frac{1}{2}$" Motorised Lathe, 3-jaw, 4-jaw, drill chucks 4 TP, other accessories. Bench drill, brazing lamp, 500 M.E.s, £45.—2, Isabella Road, Homerton, London, E.9.

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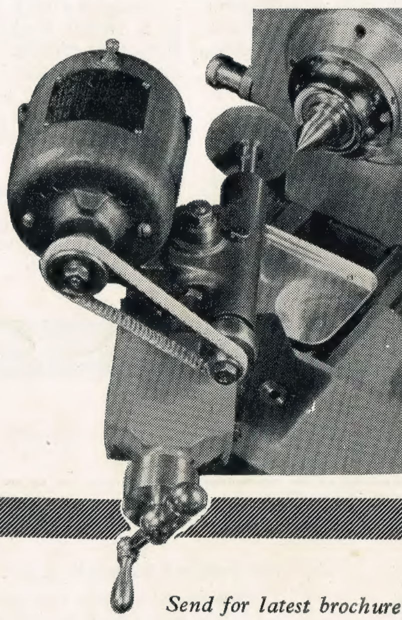

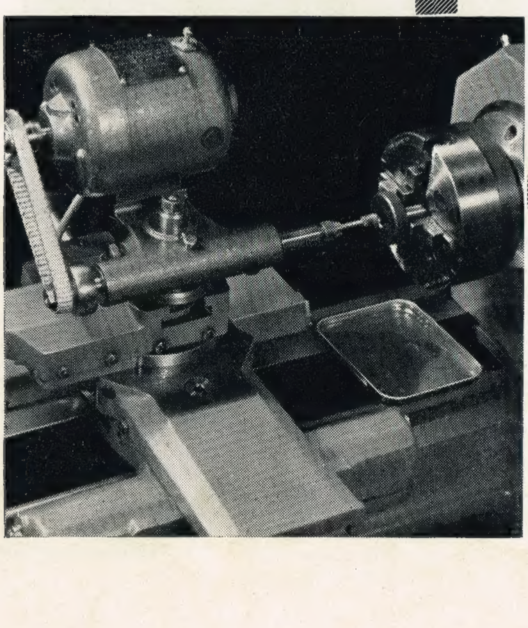

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